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ABSTRACT

The manual is intended to help school psychologists determine strengths and weaknesses, establish goals, and prescribe interventions for students with difficulties in mathematics, spelling, and written language. Research on sources of mathematical difficulties, theoretical bases, and hierarchies in mathematics is reviewed, procedures for formal and informal assessment (including task analysis and error pattern analysis) are discussed, and suggestions are offered for mathematics remediation. The section on spelling considers models, factors influencing performance, and specific spelling disabilities. The diagnosis of spelling problems is addressed, as is instruction/remediation based on assessment information. The final section focuses on written expression noting the sequence of skills, diagnostic considerations, and suggestions for remediation/instruction. Each section concludes with extensive appended material (e.g., check lists of skills and types of individualized instruction). (CL)

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Guidelines for the School Psychologist:
The Diagnostic Process in Mathematics, Spelling, and Written Expression

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1 5 3 4 5 6 7 8 9

I WANT TO PLAY

We all went to play at the school yard. My class went on a feild trip yesturday. It was lot of fun.

185
× 46

$5(2 \div 40) - 7(3 \div 36)$

$\sqrt{28}$

My friends and I are going rollerskating Saturday.

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Iowa Department of Public Instruction
School Psychological Services

GUIDELINES FOR THE SCHOOL PSYCHOLOGIST:

The Diagnostic Process in Mathetics Spelling and Written Expression

By Katheryn Gerken, Ph.D.

1983

Introduction

A major goal for assessment is the acquisition of relevant information that will contribute to the decision making process. Such assessment should lead to the clarification of the presenting problem and those factors which influence it, assist in making decisions concerning the types of intervention needed, and provide a means to evaluate the effects of intervention. The professional and popular literature is replete with articles indicating that far too often assessment does not meet any of the above goals. Ysseldyke (1979) reported that a major problem with current assessment was the widespread use of technically inadequate tests in making decisions about students. Ysseldyke, Algozzine, Regan, and Potter (1980) constructed a computer-simulated decision making program. All of the 159 volunteer subjects had previously participated in at least two placement team meetings. The subjects were regular education teachers, special education teachers, administrators, school psychologists, and other support personnel. The results of the study indicated that initially the subjects selected devices that were adequate in regard to norms, validity, and reliability, but as the subjects reviewed more devices, the number of technically adequate measures selected decreased and the number of technically inadequate measures chosen increased. Ysseldyke, et al., (1980) stressed the need for preservice and inservice training programs to place more emphasis on using technically adequate assessment devices.

The concern with appropriate assessment is not new, but has received more attention during the last decade. It is certainly time for school psychologists to ask themselves what steps they can take to provide assessment that will lead to positive changes for students. It has been easy for school psychologists and others to place the blame for inadequate assessment on the assessment instrument. However, it is up to the psychologists to select instruments that have adequate reliability, validity, and utility. An ideal test instrument would be technically adequate as well as comprehensive, precise and economical. However, it is clear that there are few, if any, instruments that fit that description, especially in the area of academic skills.

An important change is taking place in the search for appropriate assessment instruments. Because so many of the currently popular individual assessment devices are technically inadequate, the professionals are being forced to restructure their own process of assessment. They must ask what decisions are being made, what information is needed, and where can the information be obtained.

One should first look at the technical adequacy of a test, but utility must also be investigated. A technically adequate test that results in scores and no other information will not be very useful for planning intervention. The achievement test whose content does not reflect the curriculum in the school or classroom also has limited value. The selection process goes beyond choosing a group vs. individual

test, screening vs. diagnosis, normative vs. criterion referenced, etc. The psychologist's quest is for instruments that are technically adequate, provide a large enough behavior sample and can be linked to the curriculum.

When one begins to search for information regarding the assessment of mathematics, spelling, and written expression, it becomes apparent that these areas have received relatively little attention in comparison to the assessment of reading. The scarcity of technically adequate, useful instruments necessitates the combination of formal and informal techniques for both testing and teaching. The psychologist will find it necessary to reconsider the use of group tests for screening rather than using inadequate individual tests.

Reviews of various assessment instruments by Hammill and Bartel (1978), Salvia and Ysseldyke (1981), and Wallace and Larsen (1978) contain overlapping, sometimes contradictory, but valuable information. Contrary to psychologists' popular belief in the "inherent" goodness of individual vs. group tests, the reviews point out that group tests are often technically superior to the individual tests, have larger samples of behavior, and can be more directly linked to curriculum. Salvia and Ysseldyke's (1981) review of five popular group administered achievement batteries reveals that far more information regarding achievement in mathematics, spelling, and written expression can be obtained from a normative and/or criterion referenced analysis of these instruments than from most of the individually administered multiple skill or single-skill achievement tests.

Another aspect of restructuring the assessment process will be necessity for some psychologists to acquire skills in informal assessment. As Ashlock (1972) pointed out "It is better to spend your time as professionals analyzing the written work of children and planning remedial instruction than it is to use what time you have for scoring" (p. 2), especially in view of the limited value of scores.

The scope of this paper is to provide the school psychologist with guidelines for determining strengths and weaknesses, establishing goals, and prescribing interventions for students with difficulties in mathematics, spelling, and written language. Mash and Terdal (1974) state that it is the way assessment information is used that gives significance to the process. The goal of every psychologist should be to use assessment information to affect positive changes. Assessment should not be performed unless it will be useful in forming decisions of benefit to the person who is having problems.

Mathematics

Mathematics

Introduction

In 1978 Bartel, Wallace, and Larsen reported that there was surprisingly little information in the professional literature regarding the types of disabilities students have in mathematics, the diagnosis and remediation of these disabilities, and the effects these disabilities have on students. However a current perusal of the literature indicates that at least three of the professional journals devoted to mathematics: Arithmetic Teacher; Mathematics Teacher; and Journal for Research in Mathematics Education deal directly with the above concerns. An annual listing of the research in mathematics education appears in the Journal for Research in Mathematics Education.

During the 1977-78 school year a second major mathematics assessment was conducted by the National Assessment of Educational Progress (NAEP) (Carpenter, Kepner, Corbitt, Lindquist, & Reys, 1980a, 1980b, 1980c). The subjects were 70,000 students selected nationally to represent 9, 13, and 17-year-olds. Item sampling techniques were used to limit administration time. Not all subjects within age groups had the same items, but all had about 40 exercises to complete. Each content area of math was assessed at four cognitive levels: knowledge, skills, understanding, and application. The results indicated that, in general, the 9, 13, and 17-year-olds performed at an acceptable level on knowledge and skill exercises. However, the authors noted that mastery of many skills is not accomplished at the time of major emphasis in the curriculum. The stablization of the skills appears to come after they are used for a length of time and in different contexts. Concern was expressed that current high school curriculum does not take into account that many basic skills are not well developed by the time students begin algebra and geometry. An example given was that very few 13 or 17-year-olds had mastered percent concepts or skills. (It appears that maintenance of acquired mathematics skills is a very appropriate goal for high school students who may not be enrolled in a current math class). The major conclusion from the NAEP assessment was that "students appear to be learning many mathematical skills at a rote manipulative level and do not understand the concepts underlying the computation" (Carpenter, et al., 1980a, p. 47). The area that warrants immediate attention is problem-solving, for at all age levels and in every content area performance was extremely low on exercises requiring problem-solving or application of mathematical skills.

Relative to the students' affective responses to mathematics, the general results of self-report measures for the 13 and 17-year-olds indicated that: the 13-year-olds rated math as an easy subject and the most important one compared to science, social studies, English, or Physical Education; the students perceived their role in mathematics classes as a passive one; most students had never made reports or done projects in math; most students claimed they enjoyed math; over three-fourths of the students indicated math was useful in solving everyday problems. Carpenter, et al., (1980(c)) point out the limitations of self-report studies, but feel the obtained information could lead to improved communication between teachers and students.

The NAEP study was done with carefully selected students who were thought to be representative of average, 9, 13, and 17-year-olds. Thus, the problems that are apparent at a national level may appear in the students who are referred to you, but you will also encounter students with many more problems in mathematics.

Sources of Difficulties

The difficulties the students have in mathematics may develop from many sources. Aiken's 1976 update on the research relative to math attitudes indicates that there is a complex interaction of numerous variables which seem to influence math attitudes and achievement. Student and teacher characteristics, course content, method of instruction, parental support, etc., are all worth investigating along with specific personality variables and sex of student.

Wallace and Larsen (1978) report that difficulties in math are due to four major reasons: (a) lack of readiness; (b) poor teaching; (c) inappropriate emphasis; and (d) lack of motivation. They point out remedial teaching techniques for arithmetic are not included in many teacher training programs or in inservice programs. They also believe that there is a heavy emphases on skills without understanding. Bartel (1978) reports similar sources of difficulties, and she states that ineffective instruction is a major cause of learning difficulties in mathematics. Difficulties in abstract or symbolic thinking, reading problems and poor attitudes or anxiety about math may contribute to the difficulties. Reisman (1978) reports that difficulties in learning math may stem from: (a) gaps in the student's mathematical foundation - unable to perform tasks which are dependent upon this foundation; (b) lack of readiness; (c) emotional problems - cause or effect; (d) deprived environment - limited exposure to quantitative experiences; (e) poor teaching; and (f) learning disabilities - student has inefficient searching strategies inability to retrieve labels, inability to produce written responses poor short term and/or long term memory, poor spatial relations, impaired communication, and excessive fatigability. Moyer and Moyer (1978) indicate children may have problems in mathematics because of limitations in attention span, visual motor ability, visual spatial ability, memory, and symbolic comprehension. Lindvall and Ibarra (1980) found that an inability to read open addition and subtraction problems deterred students from solving and demonstrating the problem with manipulatives.

Radatz (1979) provides an excellent review of the causes of errors in mathematics. He also points out the difficulty of making a sharp separation among the possible causes because of the close interaction among causes. He believes that a definite classification and hierarchy of error causes is impossible to achieve. He reports that error analysis in mathematics education has a long history (research studies were cited over 50 years ago) and that part of the recent increased interest in error analysis is due to disappointment with and skepticism about the available achievement tests in math and the need for skillful, specific diagnosis. He has developed an

information-processing classification of errors which consists of five types of errors: (a) errors due to language difficulties - a misunderstanding of the semantics of mathematical text is often the source of the students' errors, word problems are especially open to errors in translation; (b) errors due to difficulties in obtaining spatial information-errors result from individual differences in students' spatial imagery or spatial thinking; (c) errors due to deficient mastery of prerequisite skills, facts, and concepts - usually there are large individual differences in the elements of previous knowledge available; (d) errors due to incorrect associations or rigidity of thinking - students develop cognitive operations and continue to use them even though the conditions of the task have changed; (e) errors due to the application of irrelevant rules or strategies - the error may stem from successful experiences in applying comparable rules or strategies in other content areas.

Radatz (1979) states that these five types of errors should be seen as elements of a model for grouping the errors. Some of the additional aspects of information processing that are responsible for errors in math include: failure to consider the relevant conditions of a problem; failure to complete the solution process; loss of intermediate solutions; and one-sided use of concepts. He also suggests that when analyzing math errors one should keep in mind that most errors are derived from the students' use of very individual and sensible rules or strategies.

The above causes of difficulty in mathematics point to the necessity of a diagnostic approach to mathematics assessment. What are the steps needed to begin such an approach? Whose responsibility is it?

Theoretical Base

If one is going to conduct assessment in mathematics, plan intervention, implement it and evaluate it, then knowledge of mathematics and children/adolescents is mandatory. Glennon (1981) believes that to facilitate learning in mathematics, one must have a well formed theory of instruction. He believes the theory must be complete, general, readily comprehended, and easily applied. He discusses five essential variables in a theory of instruction: (a) the mathematics itself; (b) sources of the mathematics curriculum; (c) sources of the teacher methodology; (d) sources of motivation of learning; and (e) consolidating learning.

The Mathematics Itself

A thorough knowledge of the mathematics that is appropriate to the students being taught is essential. Glennon (1981) reports research studies that have consistently shown that the general mathematics teachers, regular classroom teachers, and special educators have limited understanding of the mathematics commonly taught to students.

Sources of Mathematics Curriculum

Glennon (1981) believes that, in order to make appropriate decisions regarding the essential mathematics for each student, one must investigate three theories of curriculum: logical, sociological, and psychological. The logical theory implies that the structure essential for learning is in mathematics itself. The five assumptions basic to the logical theory are:

1. Mathematics can be arranged in a logical order.
2. Mathematics is learned best when it is in a logical order.
3. Readiness to learn a new topic is a function of the sequencing of prior learning.
4. The content selected and its sequencing can best be determined by specialists in mathematics education.
5. The best way to insure that the mathematics program is arranged in a sequentially sound manner is to arrange it according to its logical structure (Glennon, 1981, p. 28).

One major advantage that is listed for the theory is that there is greater assurance that there will be fewer gaps or omissions in the teaching. While a major disadvantage is that the subject matter seems to take precedence over the student.

The sociological theory is referred to as the applied or socially useful mathematics. The four assumptions basic to the sociological theory are:

1. Certain persistent, recurring personal and social situations require mathematics that can be identified and built into school curriculum. Such a curriculum is the best preparation for competent adulthood.
2. Learning is best when it involves solving problems that are real and important to the individual.
3. A satisfactory level of competency or proficiency in arithmetic can be achieved through a curriculum that is centered in everyday personal and social problems.
4. Since children are social beings, their curriculum should be developed from the problems of social beings (Glennon, 1981, p. 30).

One major advantage of this theory is that increased motivation will result from a curriculum based on real-life situations. However, a major disadvantage is that such a program may fail to develop adequate basic mathematical knowledge of relationships and structure.

The psychological theory is sometimes referred to as the expressed needs of the child's point of view. The three basic assumptions of the theory are:

1. The child learns best when content is directly related to an immediate need

2. The learning situation in which there is the greatest freedom to learn is the one in which the greatest learning will take place.

3. The learning that takes place in a free environment is not only adequate to meet the problems that arise but also adequate to meet the problems that arise in life outside the school. Solving real personal problems today is the best preparation for adult life (p. 32).

A major advantage touted for this theory is that a child-centered curriculum facilitates and increases learning, retention, transfer of learning, and ability to solve real-life problems. However, a major disadvantage is that teaching concepts or skills for which the student has an immediate need, without teaching the prerequisite learnings may be unnecessarily difficult or even unsuccessful.

Glennon's (1981) model for these sources of the curriculum indicates that the "average" student would draw equally from all three theories. Whereas the source for the slower learner would be closer to the sociological theory, the gifted and talented learner would be moving toward the logical theory, and the emotionally disturbed learners curriculum would be based on a well organized psychologically structured learning environment. Glennon believes that if the teacher has a model of curriculum theory, he/she can make wise decisions regarding which math is of most worth for individual students.

Sources of the Teachers Methodology

Three basic teaching methodologies are: (a) teaching as telling; (b) teaching as guided discovery; and (c) teaching as psychotherapy. "Teaching as telling" seems most appropriate when what is being taught is arbitrary associational material, whereas "teaching as guided discovery" is appropriate when the learning increases in complexity through the higher concepts, generalizations, and problem solving. "Teaching as psychotherapy" is primarily concerned with the affective domain of objectives. The model Glennon (1981) presents for sources of the teacher's methodology is a triangle shape in which the center is labeled "discussion method" and it draws on all three of the methodologies.

Sources of Motivation for Learning

The three major sources of motivation Glennon (1981) discusses are: (a) the social motives; (b) the ego-integrative motives; and (c) the cognitive motives. The social motives arise out of one person's interaction with others. The ego-integrative motives refer to the learners feelings, needs and drives, habits and instincts, attitudes and appreciation. The cognitive motives are ways of arousing interest in the subject matter that is to be learned. A triange is used as the model for sources of motivation. It is possible that the source of motivation is a mixture of all three basic sources.

Consolidated Learning

Consolidation experiences can be integrative or repetitive. Integrative experiences are used to develop meaningful concepts, generalization and problem-solving abilities; while repetitive experiences facilitate, fix, maintain, increase, or restore a skill or ability that has already been acquired.

Hierarchies in Mathematics

In order for either the teacher or psychologist to become competent math diagnosticians, they need to be aware of theories of instruction and the general goals of mathematical programs. Both instruction and

evaluation should be planned with appropriate attention to cognitive hierarchies or levels of domain. Within the domain of school mathematics. There are many sources available to help clarify the goals: curriculum guides, scope and sequence charts, and various taxonomies and hierarchies of objectives. Bloom's Taxonomy of Behavioral Objectives Cognitive Domain (1956) is presented by several authors as a tool for classifying mathematics objectives or hierarchies (Bartel, 1978; Reisman, 1977, 1978; Weaver, 1970). The major categories of Bloom's Taxonomy are: knowledge, comprehension application, analysis, synthesis, and evaluation. Adaptations of the taxonomy have been made to fit school mathematics. The adaptation made in connection with the National Longitudinal Study of Mathematical Abilities (NLSMA) has seven levels of cognitive behavior; knowing, manipulating, translating, applying, analyzing, synthesizing, and evaluating (Romberg & Wilson, 1968) and the categories of mathematical content are: number systems, geometry, algebra, computation comprehension, application on analysis. The Avital and Shettleworth (1968) adaptation has three levels of mathematical thinking: recognition or recall, algorithmic thinking, and open search. Six categories of an ability process dimension were identified by Epstein (1968) for use at Educational Testing Service (ETS): recall factual knowledge, perform mathematical manipulations, solve routine problems, demonstrate comprehension of mathematical ideas and concepts, solve non-routine problems requiring insight or ingenuity, apply higher mental processes to arithmetic.

Bartel (1978) reports Buffie, Welch, and Paiges (1968, p. 6) broadly stated goals for mathematics and adds an additional goal.

1. Development of computational facility.
2. Development of mathematical understanding.
3. Development of rational power (including divergent, logical, and creative thinking).
4. Development of a positive attitude toward mathematics.
5. Development of an understanding of how mathematics computation and concepts are utilized in real-life situations (Bartel, 1978, p. 100).

Sauviney, Keyser, and Sarver (1978) and Copeland (1979) present hierarchies of mathematical concepts which are based on Piegetian concepts (Appendices I & II) Marks, Pierdy, Kinney, and Hiatt (1975) provide a broad view of an elementary school math program by outlining major concepts and topics that are introduced and a general sequence for their introduction. They recommend that specific information be obtained by examining up-to-date textbook series. Their outline is as follows: (a) sets and numbers; (b) computation; (c) numeration; (d) measurement; (e) geometry; (f) applications; and (g) structure. Five major goals for the K-8 math program are reported and illustrated: (a) Development of concepts; (b) Development of mathematical understanding; (c) Development of skills; (d) Ability to solve problems; and (e) Development of application and favorable attitudes.

Specific teaching goals are usually formulated from broad lists of skills and abilities. These broad lists are usually available through curriculum guides, teacher manuals, and various scope and sequence charts. Often local school districts and state departments of education

have developed their own curriculum guides or scope and sequence charts, they will still serve as guidelines for planning assessment procedures. Ideally, a school psychologist would obtain the scope and sequence chart or curriculum guide or hierarchy being used in each of his/her assigned schools. The more specific the guidelines, the more helpful they will be in the diagnostic process. Appendix III contains a copy of a detailed scope and sequence chart for K-6th grade and Appendix IV contains a copy of sequential arithmetic skills based on mental age. Bartel (1978) also provides an example of a scope and sequence chart (Appendix V). Appendix VI has an outline of the general hierarchical interrelationships between and among various areas of mathematical functioning.

Thus, after determining there are difficulties in mathematics, a summary chart such as this can aid the diagnostician in determining whether a student has the necessary underlying concepts and capacities required for the tasks.

The Mathematics Diagnostician

Whereas Glennon (1981) has expressed the need for the classroom teacher to have a sound theory of mathematics and be able to establish a good psychoeducational match for students in the teaching and learning of mathematics, it is this writers belief that the school psychologist will often have to share in the responsibility. The psychologist should already have a foundation in instructional psychology, but would have to acquire mathematical knowledge.

Anderson (1981) advocates that the responsibility for the psycho-educational match be given to fully trained mathematics diagnosticians. He states that developing the ability to serve as a competent diagnostician is very difficult to achieve as the good diagnostician must know that both the subject matter and children. He points out that not all teachers have the interest or capability of becoming competent diagnosticians. His role for the diagnostician will include recognizing when carelessness, frustration or boredom are inhibiting the student's performance, reviewing the written work, observing, interviewing, detecting error patterns, etc.

Current economic constraints make it unlikely that an additional support person will be trained or hired by the school districts. Thus the role of diagnostician must be assumed by those professionals already in place. This writer believes that the school psychologist and classroom teacher could provide a thorough diagnosis of mathematical difficulties if they work together during the diagnostic process.

The Diagnostic Process in Mathematics

Reisman (1978) reviews five major steps in the diagnostic process:

1. Identifying the student's strengths and weaknesses in mathematics.

2. Hypothesizing possible reasons for these strengths and weaknesses.

3. Formulating behavioral objectives to serve as a structure for either utilizing the strengths or remediating the weaknesses.

4. Creating and trying remedial procedures.

5. Ongoing evaluation of all phases.

Scheer (1979) suggests that just as there are certain rules for social exchange or communication between people there is "an etiquette of diagnosis":

1. Accept the student's failure as well as correct answers.

2. Don't cue the students when they give an incorrect answer.

3. Be thorough.

4. Don't interrupt the students when they make an error.

5. Keep a record of each session.

6. Don't hurry the student.

7. Avoid answering direct questions regarding the correctness of responses.

8. Don't lead the student through questions in order to elicit correct responses.

9. Ask the students to think out loud.

10. Repeat the students' answers when they are responding orally in the diagnostic session.

11. Encourage students to cross out and start over rather than erase written problems.

12. Make a note of behavior patterns.

The first step in the diagnostic process is the determination of needs. If screening of the referral information indicates some concern regarding math abilities, the school psychologist should attempt to find out what is already known concerning the student's math skills. Are there examples of the student's written work, prior test results, other types of evaluations? What role do others (parents, etc.) take in the students math education? If the analysis of the referral indicates a need to obtain additional information, the psychologist must first understand the goals in mathematics for this student in order to know what to assess. The psychologist needs to obtain the scope and sequence chart, list of objectives, or whatever is used to determine expectations in order to determine where a particular breakdown might be occurring. Next a decision must be made as to what techniques will be used to collect data and who will collect the data. The process will need to be carried out by both the psychologist and classroom teacher. They need to work together to determine what information each will gather. Often, a general

classroom teacher will lack specific knowledge of mathematic skills as well as knowledge of the psychology of learning. He or she may be able to administer and interpret some of the techniques, but not all of them.

Formal Assessment

There is nothing wrong with beginning assessment with a survey test or measure of overall performance as long as assessment does not stop with the survey test. If the student has had a recent technically adequate survey test (such as the Stanford Achievement Test or Stanford Test of Academic Skills), ask to see the results and discuss them with the teacher. This would give a general idea of the student's functional level in mathematics. If the record booklet and answers are available an analysis of the errors should be made. If the student has not had a recent survey test, then the psychologist should choose a technically adequate one that will provide the most information concerning the acquisition of math skills and concepts (See Table 1 regarding information about survey tests). A group test is not invalidated by being administered individually. If such a test is administered individually to the student, note behaviors and discuss the student's responses with him/her after the testing is completed. Ask the student to tell you how he/she solved the problems. If there is any question regarding the relationship between the students difficulties and a fear or dislike of mathematics, a brief attitude survey could be administered by the teacher or psychologist (Dutton & Adams, 1961; Dutton & Blum, 1970, Sandman, 1980).

There are numerous tests that have been developed as diagnostic math tests, but few of them provide enough information regarding strengths and weaknesses (See Table 2 for information regarding popular "diagnostic" tests). They may only be able to identify broad areas that need further diagnosis. Therefore, if a technically adequate survey test has already been used to identify broad areas of difficulty, there is no need to waste time administering a standardized diagnostic math test that adds no additional information. Some of the standardized diagnostic tests could be used as informal tests to identify specific problem areas. For example, Trembley, Coponigro, and Gaffney (1980) administered the WRAT and PIAT to 224 students in grades 3 to 6, who had been identified as having learning disabilities in arithmetic (subscore means 18 months or more below grade level). Task analysis was then used to derive behavioral objectives from the subtest items, and a task analytic approach was used to teach those objectives during an eight month intervention period. Although there were problems with the design of this study, the rate of growth in math did exceed the pre-post change normally expected. Performance on the spelling subtests had been used as a control since no specific instruction was provided in that area.

The Diagnostic Chart for Fundamental Processes in Arithmetic (Buswell & John, 1925) is over 50 years old, yet it is one of the best examples of a commercial assessment technique that is analyzed via informal techniques. It is not a standardized test and it yields no scores. It provides the user with specific information concerning the method a student uses to solve problems in addition, subtraction, multiplication, and division. The student is asked to complete problems in each area while working out loud. While the student is working, the examiner makes

TABLE 1

Standardized Survey Tests that Measure Arithmetic Achievement

Instrument	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Recommended Use and/or Comments
Brigance Diagnostic Inventories	Developmental level less than 7 years through secondary school age	CR	None	Content	Numbers Operations Measurement Geometry Decimals Percent Metrics Math vocabulary	Planning and evaluating math instruction. Comprehensive Flexible
California Achievement Test - (CAT) Mathematics	K-12	NR & CR	Internal consistency Test-retest Reliability in CR use	Content Cross-validation	Computation Concepts and applications	Adequately standardized reliability and validity evidence good. Screening and could be used diagnostically.
Iowa Test of Basic Skills (ITBS) Mathematics	K-9	Yes	Internal consistency	Content Criterion validity based on earlier forms of the test.	Concepts Problem-solving Computation	Development and standardization of ITBS and
The Tests of Achievement and Proficiency (TAP) Mathematics	High school	Yes	Internal consistency	Content Criterion validity based on earlier forms of the test.	Understanding of math principles. Use of math in everyday living.	TAP adequate. Need test-retest reliability screening

Instrument	Grage/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Recommended Use and/or Comments
Metropolitan Achievement Test - (MAT) Mathematics	K-12	NR & CR	Internal consistency	Content Criterion related	Instructional battery includes numeration, geometry and measurement, problem-solving, operation of whole numbers and operations (law and properties).	There are 2 sets of tests: Survey and Instructional Materials contain detailed content outlines, objectives for each item, guidelines for interpretation. Technically adequate, can use the instructional battery for planning and evaluation.
Peabody Individual Achievement Test - (PIAT) Mathematics	K-12	Yes	Test-retest	Content concurrent	Matching skills through trigonometry	Reliabilities of subtests too low for making decisions. Only content validity evidenced. Multiple choice format limits its usefulness. Screening only.
Stanford Achievement Test - (SAT) and The Stanford Test of Academic Skills	Grades 1.5 - 9.5 High school	Yes	Split-half estimates KR-20 Coefficients	Content Criterion	Concepts computation application	Standardization reliabilities and validity exceptionally good. Provides instructional

Instrument	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Recommended Use and/or Comments
						objectives and suggestions for teaching the objectives.
Wide Range Achievement Test (WRAT) Arithmetic	Preschool-adult	Yes, but not a national sampling.	None reported for 1978 revision.	No appropriate data except developmental.	Counting Reading numbers Solving oral problems Performing written computation	Limited behavior sampling, inadequate standardization, absence of reliability and validity data. Can do an error analysis of responses.

NR=Norm Referenced
CR=Criterion Referenced

*This table was prepared from material by Bartel, 1978; Howell & Kaplan, 1980; Salvia & Ysseldyke, 1981; Wallace & Larsen, 1978; and Ysseldyke, 1980, as well as from this author's experiences with the instruments.

TABLE 2

Diagnostic Mathematics Test

Instrument	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Recommended Use and/or Comments
Basic Educational Skills Inventory	Elementary	CR	None	None	Readiness Skills, Basic Operations, Decimals, Fractions, Times, and Money.	Retrieval system that refers the teacher to instructional materials.
Diagnosis: An instructional aid in math	K-6	CR	None	Content	Computation, Numeration, Mathematical Operations, Problem-solving, Measurement, and Geometry.	Each item matched to a specific instructional objective. Prescription guide refers teachers to sections of several basic math curricula.
Diagnostic Chart for Fundamental Processes in Arithmetic	Those who have received instruction in the basic operations grade 2 and above.	No	No	No	Addition, subtraction, multiplication, division	Can analyze the errors the students make. The manual provides remedial suggestions.

Instrument	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Recommended Use and/or Comments
Diagnostic Math Inventory	1.5-8.5	CR	No	No	Multiple choice tests covering 325 math objectives.	Has three learning activity guides that match test items and objectives to specific learning activities. A guide to ancillary materials relates objectives to non-text-book materials and the Master Reference Guides direct one to specific pages in math text-books where the objectives are being taught. Should be very use-ful in planning instruction.

Instrument	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Recommended Use and/or Comments
Diagnostic Tests and Self-Helps in Arithmetic	3-8	CR	No	No	Basic operations, fractions, decimals, percent, and measurement.	Has screening test, diagnostic tests, and self-helps. The diagnostic tests are related to the self-help activities; may be used as a supplement to California Arithmetic Tests
Key Math	K-8 (interesting to note 3 evaluators listed 3 different grade levels)	NR & CR	Internal consistency	Content limited concurrent	Content, operations, and application.	Useful as a criterion referenced instrument. Behavioral objectives listed for every item need additional data regarding validity.

Instrument	Grade/age level	Norms	Reliability	Valdity	Skills Measured	Evaluators Recommended Use and/or Comments
Stanford Diagnostic Mathematics Test	1.5 - high school	NR & CR	Internal consistency alternate-form	Content criterion-related	Number systems and numeration, computation, applications.	Well standardized "Progress Indicators" provide a criterion referenced evaluation; can be used to pinpoint strengths and weaknesses. Has a multiple choice format; limits error pattern analysis.

NR=Norm referenced
CR=Criterion referenced

*This table was prepared from materials by Bartel, 1978; Howel & Kaplan, 1980; Salvia & Ysseldyke, 1981; Wallace & Larsen, 1978; and Ysseldyke, 1980; as well as from this author's experiences with the instruments.

notes regarding the student's problem solving habits. (Appendix VII contains the list of work habits developed by the author.) The examiner summarizes the errors made consistently through the test. The manual has remedial suggestions for helping the student learn new work habits.

Informal Assessment

Diagnostic Tests/Inventories

There are numerous books and articles that have been written regarding the development of "teacher-made" tests or informal inventories (Bartel, 1978; Fowler, 1979; Hadley, 1977; Inskeep, 1978; McKillip, 1979; Reisman, 1977, 1978; Wallace & Larsen, 1978). The guidelines vary but have some general commonalities that will be beneficial in developing a test. Teacher made tests also vary and could take the form of a very thorough inventory or a checklist for a specific instructional sequence such as telling time. Appendix VIII contains an example of a thorough mathematics inventory by Reisman (1978), and Appendix IX contains a simpler test and a follow-up checklist for the basic operations in math.

Guidelines for developing a test:

1. Decide the purpose of the test. Is it to assess one specific skill area? Use the results of the survey test to help determine the purpose.

2. Choose the content to be assessed. Use a scope and sequence chart, curriculum guide, etc., to make sure the content is appropriate.

3. Determine the appropriate level of learning for the individuals. Again use the scope and sequence chart or other hierarchical classification.

4. Decide on the desired behaviors for each skill area and identify the prerequisite behaviors. Use a hierarchical chart or conduct a task analysis of each of the desired behaviors. Ashlock (1970) offers suggestions for writing behavioral objectives in mathematics.

5. Write the actual items. They may be chosen from other sources.

6. Make sure sentence structure and reading level is appropriate for students being assessed. Assess math skills not reading.

7. Make sure there are several items for each skill area assessed in order to insure reliability.

8. Ask the following questions.

   a. Is the test all paper-pencil?

   b. Are activities with concrete objects needed?

c. Does the testing situation parallel the teaching situation?

d. Are there pointing responses for the students who have trouble writing responses?

e. Are extrapolation activities included to show transfer of present knowledge to new situations?

9. Interview the students regarding errors. Was the item missed because of misinterpretation, etc.?

The Oral Interview

Bartel (1978) and Schoen (1979) suggest that the oral interview can be used to provide additional information regarding a students error strategies or it can be used to check out the hypothesis derived from other assessment daily work. McAloon (1979) stresses the importance of using questions to diagnose and remediate and states that the teacher (diagnostician) must ask questions that have the greatest potential for exposing misconceptions. Bartel's (1978) list of procedures for the interview was adapted from the work of others as well as her own experiences.

1. Select one problem area at a time.

2. Begin with the easiest problems first.

3. Tape or keep a written record of the interview.

4. The child simultaneously solves the problem in written form and "explains" what he is doing orally.

5. The child must be left free to solve the problem in his own way without a hint he is doing something wrong.

6. Avoid hurrying the pupil (Bartel, 1978, pp. 118-119).

Schoen (1979) believes that the oral interview can yield at least partial answers to these questions:

1. Why does a particular skill, concept, or problem seem difficult for some students?

2. How are students interpreting the symbols they see and explanations they hear?

3. How does the class, or specific students in it, view mathematics?

4. How does a particular change in instructional approach change the students' perceptions and strategies?

5. What individual traits does each student possess that may help explain his or her learning problems? (Schoen, 1979, p. 37)

It is apparent that the amount of time needed for an oral interview seriously limits its usefulness. Therefore it should be used only when additional information is needed to pinpoint the problem area.

Observation

Observation by both the classroom teacher and the psychologist could be a very beneficial technique in analyzing a student's skills in mathematics. The technique can be used formally or informally, but it should be part of every step in the assessment process. Observation may be used for environmental assessment as such assessment could be done via checklists, videotapes, direct observation, detailed environmental analyses, etc. It might be used to add information to the quantitative and qualitative aspects of other assessment, confirm the findings from informal and formal assessment, or assess certain specific skills, behaviors, and interactions which have not been studied via other techniques. It could be used to reduce the redundancy in formal testing. Observation is a process of looking at and recording behavioral information. There are numerous types of observation techniques, but the four basic observation techniques are anecdotal records, checklists, behavioral rating scales, and systematic observation. Anecdotal records are generally narrative descriptions of what has been seen. They are highly subjective and usually contain personal bias. Checklists are simple lists of adjectives or descriptors of behavior. They should be a more objective means of looking at behavior. The third technique, behavioral rating scales, allow the observer to indicate both the occurrence and degree of a behavior of interest. It is possible to obtain reliability checks and these techniques are relatively objective. However, they do not give a precise indication of the frequency or importance of the behavior being rated. The fourth technique, systematic observation, is the most precise technique as it requires the direct observation and recording of behaviors as they occur. The behaviors to be observed must be specified and defined in advance. Walker (1977) describes the "pinpointing" process in which only those behaviors which are controllable, repeatable, contain movement, and have a starting and termination point are considered observable.

Observation can be as simple as looking at a sample of a child's work or as complex as a rigorous naturalistic observation system which requires that normative peer data be obtained as well as data regarding the target child. Within each of the techniques of observation, there will be a great deal of variability depending on what is to be observed and who is doing the observation. One might decide to combine several observation techniques or simply use one to gather information, keeping in mind the strengths and weaknesses of each technique.

Error Pattern Analysis

In order to complete a diagnostic evaluation one must know how a student learns. What errors does he/she make? What is the rationale for the errors, and what needs to be learned in order to remediate the situation? An accurate diagnosis should reveal the cause of the errors and at least suggest ways of eliminating the errors. Errors can be evidenced in the student's daily work, on tests, through the oral interview, etc. Lists of common errors can be helpful to the teacher and psychologist (See Appendices VII and X). How does one actually analyze errors? Error pattern analysis simply requires the examination of the errors an individual makes in order to determine if any consistency in errors exist. The basic steps in error pattern analysis are to:

a. find and mark the errors:

b. fill in the correct response;

c. describe the errors;

d. state a tentative conclusion;

e. confirm the conclusion by observing the student's performance in other situations where the same skills are required; and

f. finally state a diagnostic hypothesis.

An example of an error pattern analysis would be to:

a. ask a child to label objects;

b. determine which objects were labeled incorrectly;

c. explore all the possible reasons for incorrect labeling and eliminate them one by one;

d. state a tentative hypothesis;

e. check it out by observing if the child labels these objects correctly in other situations; and

f. if tentative conclusion is confirmed, begin work on the diagnostic hypothesis.

The error pattern analysis can be conducted quickly if there has been direct observation of the student completing math tasks or if the student's calculations are available. It is more difficult to do an error pattern analysis if the questions and answers are all that are available. Ashlock (1972) and Reisman (1978) are excellent resources for studying error patterns and their analysis.

Task analysis. The breaking down of a task or objective into all of its component parts is called task analysis. It assistsin identifying all the subtasks which the learner must be able to perform so that a task can be accomplished. Many criterion-referenced and/or informal tests use a form of task analysis in structuring their items in order of difficulty. Commercial and computer based programs which analyze pre-academic and academic skills have now been developed. Several books have been written which teach the skills of task analysis. Thus, the following are very simple guidelines for conducting a task analysis. It is used as both an assessment and intervention tool, and it requires the isolating, describing, and sequencing of the subtasks which will enable the student to perform the objective (Bateman, 1971). One begins with an instructional objective the student is having difficulty with, break it into subtasks, construct a checklist with a test item for each subtask, administer the checklist, and teach the student the subtasks he/she does not know (Holmes & Ford, 1978, p. 54). Only behaviors which can be seen, heard, measured or counted are appropriate and one must concentrate on the objective that is being assessed or taught.

3. chaining;

4. verbal association;

5. multiple discriminant learning;

6. concept learning;

7. principal learning; and

8. problem solving.

She provides examples of each type of learning with suggestions as to how to use each in teaching mathematics.

Skypek (1981) suggests that the theory and practice advocated for teaching and learning language has implications for teaching and learning mathematics. She presents four sequential levels for learning in mathematics:

1. non-verbal experiencing with things and people;

2. verbalization, or oral language, matching thought with speech and one's own mind with the mind of others;

3. recording and reading about quantitative ideas in the symbols of ordinary language with the symbol scheme of mathematics (Skypek, 1981, p. 16).

Davis (1978) provides a model for understanding in mathematics. It is based on the proposition that "moves" in teaching mathematics can serve as a basis for defining, understanding mathematical concepts, generalizations, and procedures, and numerical facts. He suggests that these moves can be used to establish objectives for learning activities or tests (See Appendix XII).

Relative to learning basic facts, Rathmell (1978) reports that students can profit from three types of experiences: activities with concrete materials, instruction on new thinking strategies, and drill. However, both Rathmell (1978) and Ashlock (1972) provide a valuable warning about the use of drill (which is too frequently recommended). They point out that drill simply reinforces and makes more efficient that which a student actually practices. Therefore drill for mastery should be introduced only when the process being practiced is an efficient process and the student has developed appropriate thinking strategies. Rathmell's instructional program for teaching basic facts is as follows:

Step 1. Studies should develop confidence and competence in using a model for the operation.

Step 2. Drill can begin for the easy facts, those for which even immature thinking strategies are relatively efficient.

Step 3. A model can be used to help pupils learn a more mature thinking strategy, one that will enable them to solve more difficult fact problems.

Reisman's (1977) outline for a task analysis is as follows:

1. Identify those concepts or skills that are necessary prerequisites to the end goal.

2. Word these prerequisites in behavioral terms.

3. Use them as teaching and testing guides for the instructional program.

4. Be sensitive to any changes that must be made in sequence of presentation or to any gaps in the learning hierarchy that might become apparent as a result of evaluation feedback (Reisman, 1977, p. 50).

She suggests that either a descending or ascending task analysis can be performed. Either start with the end goal and work down to the simplest behavior or start with the simplest behavior and work up step by step.

Summary. When one is choosing informal assessment techniques, it is important to remember that each of these techniques can be useful in gaining information about infants/children. However each is just one part of the assessment process and is not valid alone. They need to be used in conjunction with other techniques. One of the major weaknesses of the informal techniques is lack of specificity whether in pinpointing behaviors to be observed, writing behavioral objectives, performing a task analysis, etc. Intra- and interrater reliability and test-retest reliability data need to be gathered for these techniques.

Instruction/Remediation in Mathematics

Instruction

There are many unanswered questions regarding general instruction in mathematics, thus the information provided in this section is just a brief introduction to some of the current thoughts and/or issues in instruction.

Sauviney, Keyser, and Sarver (1978) describe three types of individualized instruction that may be used in mathematics education (Appendix XI). It is apparent that they believe Type C in which only developmental level is varied is a more viable approach to individualizing instruction than the other two types. An example of Type C would be that all children are working on the same concept at the same scheduled time but at different conceptual levels.

Reisman (1978) believes that instruction should follow some hierarchy moving from the basic form of learning to the more complex forms. She suggests that Gagne's hierarchy of eight types of learning be used:

1. signal learning;

2. stimulus response learning;

Step 4. Drill can begin for those facts that can be easily solved by the thinking strategy just learned.

Step 5. Steps 1, 3, and 4 can be repeated to introduce other models and thinking strategies as appropriate for the operation.

Step 6. Drill can be used to develop speed and accuracy in recalling the facts (Rathmell, 1978, p. 18).

Hadley (1977) makes some common sense suggestions regarding individualizing instruction in mathematics. He suggests each lesson begin with a review of basic facts, proceed to an explanation of the lesson along with problems for practice, and conclude with a match game to reinforce and assess what has been learned. He also suggests that informal discussion with the student take place to discuss progress and make suggestions for improving the lesson.

One of the questions that classroom teachers, special educators, administrators, parents, support personnel, etc., have been asking about instruction in math is the role of the calculator. The use of the calculator appears most controversial at the elementary level (Shumway, 1976). Suydam (1979) reviewed the research on the use of calculators. Although many of the studies were not well done, most conclusions indicated there were no measurable detrimental effects associated with the use of calculators for teaching mathematics. A brief perusal of the literature by this writer revealed the following: Creswell and Vaughn (1979) found that ninth-graders enrolled in fundamentals of mathematics (achievement at two years below grade level) achieved at a significantly higher level when using hand-held calculators and a specially designed curriculum than did a control group. Wheatley's (1980) study on calculator use and problem-solving revealed that the calculator has a positive influence on children's problem-solving performance. Research by Shumway, et al., (1981) revealed that 2-6th grade students enjoyed using calculators, increased their computational power, and did not develop any debilitations when instructed with calculators and tested without. In recommendations for future directions, the authors did endorse school use of calculators as long as there is appropriate monitoring of effects and significant time allotted to consideration of appropriate activities for calculator use.

Carpenter, et al., (1981) report that, as part of the 1977-78 NAEP mathematics assessment, a special test booklet was designed for each age group to assess the students' performance with a calculator. The students were given very brief instructions on the use of the calculator and were allowed to work a few practice problems. The results showed that the students did perform routine computation better with the aid of the calculator. The authors stressed the importance of introducing, developing, and encouraging strategies that take special advantage of the calculators and keep in mind that calculators do not solve problems, people do. The students must still attend to the format of a problem, be able to read and interpret it, estimate the reasonableness of their answers, etc.

Speer (1979) suggests that the cognitive learning style of the student must be looked at in order to provide the best possible instruction. However, Radatz (1979) points out the complexity of the instructional situation and states that the available research on the relationship of mathematics learning to individualized instruction, cognitive styles, specific abilities or social environmental conditions makes it clear that in regard to instruction, there are no lists of essential teacher behaviors nor is there any evidence of the superiority of one type of teaching method or style over another. He points out the need for caution in attempting to apply research findings.

The methods of instruction vary from individualized one-to-one instruction to using self-paced procedures. What is apparent is that remedial instruction should be geared to the diagnosis that has taken place. After data have been collected via formal and informal techniques, one needs to describe the student's present level of performance in mathematics, pinpointing strengths and weaknesses; establish priorities, and write goal statements in behavioral terms. Meyers and Sinco (1979) provide a comprehensive list of instructional objectives in mathematics concerning numeration, mathematical operations, and measurement. The psychologist will not be providing the remedial instruction, but should be able to help provide the guidelines for remediation.

Remedial Instruction

Ashlock (1972) provides some general guidelines for providing remedial instruction. These guidelines are appropriate for areas other than mathematics:

1. Encourage self-appraisal by the child.
2. Make sure the child has the goals of instruction clearly in mind.
3. Let the child state his understanding of instruction in his own language.
4. Protect and strengthen the child's self-image.
5. Structure instruction in small steps.
6. Select practice activities which provide immediate confirmation.
7. Spread practice time over several short periods.
8. Use a great variety of instructional procedures and activities.
9. Provide the child with a means to observe his progress.
10. Choose instructional procedures that differ from the way the child was previously taught.
11. Encourage a child to use aids as long as they are of value.
12. Let the child choose from materials available.

13. Emphasize ideas which help the child organize what he learns.

14. Stress the ability to estimate (Ashlock, 1972, pp. 4-5).

The following is a very brief synopsis of Inskeep's (1978) specific remedial suggestions for children with certain difficulties.

1. Makes errors that have an identifiable pattern and are logically consistent in the pupil's way of thinking.

   a. Examine the sequence of steps leading to the algorithm in which the error pattern occurs.

   b. Provide a physical model for manipulative activity.

   c. Develop a diagram approach to the algorithm.

   d. Use an alternative algorithm.

2. Makes random errors.

   a. There maybe nothing that can be done systematically for remediation.

   b. Check out "messiness" or "carelessness" and assist the student in positive ways to eliminate these problems.

3. Difficulty with basic facts.

   a. Make sure child understands concepts of the operation. If not, use diagrams, manipulatives to illustrate the operation.

   b. If child has failed to memorize the facts, proceed with positive drill techniques.

4. Failure to respond.

   a. Attempt to pinpoint the difficulty via an interview.

   b. Accept the children's work and encourage it.

5. Counting with markers on the test paper or objects.

   a. Use a game approach where speed is reinforced.

Ashlock (1972), Bartel (1978), Blackman (1978), and Reisman (1978) all provide excellent examples of types of difficulties in mathematics and suggestions for remediating these difficulties. There is too much information contained in these references for this writer to attempt to summarize it, but the school psychologists may want to ask their agencies to obtain these references or make appropriate copies for personal use. Bartel (1978) also provides a critique of commercially available textbooks and remediation materials/techniques that can be used for students with difficulties in mathematics. There are many

resources available for intervention suggestions such as Dr. Jim's Elementary Math Principals by Overholt (1978) and Matulis' (1981) bibliography of articles on teaching math to special education students.

As remediation is taking place, there should be continuous evaluation of the effects of intervention. Changes in procedures, goals, etc., may be warranted if progress is not being made.

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APPENDIX

APPENDIX I

Hierarchy of Developmental Concepts

Cognitive Operation	Until children are competent with respect to each cognitive operation, they should not be expected to:
1. Logical Classification	1. Assign numerals to concrete sets 2. Distinguish attributes of physical objects
2. Seriation	1. Compare sizes of sets 2. Compare numbers (>, <) 3. Compare lengths 4. Assign numerals to concrete sets
3. Conservation of Number	1. Determine equivalence of sets 2. Compare sizes of sets 3. Assign numerals to concrete sets
The child's effective understanding of the concepts listed above is prerequisite to systematic work with symbolic definition or comparison of whole numbers.	
4. Set Inclusion	1. Work with the operations of addition or subtraction symbolically 2. Work with number sentences (missing addends)
5. Transitivity	1. Work with the operations of multiplication or division symbolically 2. Compare the sizes of two objects with a measuring instrument
6. Conservation of Area	1. Define fractional parts by partitioning a whole unit 2. Utilize concrete materials that use area (i.e., geoboards, graph paper) to model abstract mathematical concepts

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7. Conservation of Length	1. Use the number line to model number operations 2. Utilize concrete materials that use length (i.e., Cuisenaire rods, ruler, slide rule) to model abstract mathematical concepts
8. Conservation of Mass	1. Define fractional parts based on a mass model (i.e., use a pan balance to define fractional parts) 2. Utilize concrete materials that use mass to model abstract mathematical concepts (i.e., invicta balance, pan balance)

Source: Souviney, R. J., Keyser, T.& Sarver, A. Mathmatters. Santa Monica, California: Goodyear Publishing Company, Inc., 1978.

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APPENDIX II

AGES AT WHICH MATHEMATICAL CONCEPTS DEVELOP

Concept	Late Preoperational Period (4-7)	Concrete Operational Period (7-9)	(9-11)	Period of Formal Operations (11-15)
Topological space	xx			
Simple classification	xx			
Seriation and ordering	xx	x		
Number conservation	xx			
Length conservation	xx	x		
Area conservation	xx	x		
Addition of classes and numbers		xx		
Multiplication of numbers		xx		
Multiple classification		xx		
Transitivity		xx		
Commutativity		xx	x	
Associativity			xx	
Distributivity				
Euclidean space—shapes	xx	x		
Euclidean space—coordination of horizontal and vertical			xx	xx
Time		xx	xx	xx
Measurement—area			xx	
Measurement—volume				xx
Projective geometry		xx	xx	xx
Proportion				xx
Formal logic			xx	xx
Probability				xx
Proofs				

Source: Copeland, R. W. How children learn mathematics, 3rd edition, New York: Macmillan Publishing Co., Inc. 1979.

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TABLE 12-1 Arithmetic Scope-and-Sequence Chart

Content				
		Level K		
Numeration	Shows that the number of objects in two or more sets have certain relationships	Recognizes numerals for cardinal numbers and makes correct assignment of numerals to sets of objects (0 through 10)		
Operations			Begins addition and subtraction	
Equations and inequalities			Begins to express equalities and inequalities	
Money				Identifies coins
Time				Recognizes that certain parts of the day can be identified Becomes aware that time is measured
		Level 1		
Content				
Numeration	Expresses whole number numerals and words (0 through 10)	Expresses whole number numerals (0 through 25)	Expresses whole number numerals (0 through 100) Expresses whole numbers in a specified pattern	Recognizes the existence of fractional and negative numbers
Operations	Begins adding (sums through 10)	Acquires basic addition skills (sums through 10)		Begins adding (sums 11 through 18)
		Level 1 (Continued)		
Operations (*Continued*)	Begins subtracting (minuends through 10)	Acquires basic subtraction skills (minuends through 10)		Begins multiplying (products through 18) Begins dividing (dividends through 18) Begins finding fractional parts of numbers (simple fractions)
Equations and inequalities			Makes simple statement of equality (addition and subtraction)	Solves selected story problems involving addition or subtraction using objects (whole numbers 1 through 10)
Money				Determines money values
Time				Tells time to the hour and half hour Names consecutively the days of the week and states that there are seven days in a week Names consecutively the months of the year and states that there are 12 months in a year
		Level 2		
Content				
Numeration	Expresses whole number numerals (0 through 1,000)	Arranges whole numbers in a specified pattern		Expresses simple fractions

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				Expresses numbers as Roman numerals (0 through XII)
Operations	Acquires basic addition skills (sums 11 through 18) Reinforces basic subtraction skills (minuends through 10)	Applies addition skills to problems involving up to three addends Acquires basic subtraction skills (minuends through 18)	Applies subtraction skills to problems involving up to three-digit minuends Illustrates the need for negative numbers when trying to subtract a larger number from a smaller number	Acquires basic multiplication skills (products through 25 including 0) Divides with whole number divisors (dividends through 18, no remainder) Begins finding fractional parts of numbers using objects or pictures
Equations and inequalities			Solves simple equations involving addition or subtraction Solves story problems using simple addition and subtraction facts	Makes simple statements of equality (multiplication and division) Solves simple equations involving multiplication and division
Money				Determines money values through 99¢
Time				Tells time to the minute
Content		**Level 3**		
Numeration	Expresses whole number numerals (0 through 1,000,000)	Arranges numbers in multiplication and division patterns	Expresses selected proper fractions Distinguishes between positive and negative numbers (integers)	Continues patterns for simple number sequences

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TABLE 12–1 *Continued*

		Level 3 (Continued)		
Operations	Demonstrates the commutative and associative properties of addition Applies addition skills to problems involving at least four, two-digit addends Applies subtraction skills to problems involving up to four-digit minuends	Recognizes the properties of multiplication of whole numbers Acquires basic multiplication skills (products through 81) Applies multiplication skills to problems involving up to two-digit multipliers and up to four-digit multiplicands Acquires basic division skills, whole number dividends and divisors (1 through 9)	Begins adding two fractional numbers (unit fractions)	
Equations and inequalities	Solves simple equations involving addition and subtraction (with grouping symbols)	Solves simple equations involving multiplication or division	Solves selected story problems using simple multiplication and division facts	
Money				Determines money values through $10.00 Identifies money values greater than $10.00
Time				Classifies periods of time Solves problems involving time

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Level 4

Content				
Numeration	Expresses whole number numerals having up to ten digits Recognizes other symbols and systems for expressing numbers		Expresses proper and improper fractions and mixed numerals Begins decimals (tenths)	Expresses numbers as products of factors
Operations	Recognizes the 0 property of addition Applies addition skills to problems involving at least four addends Applies subtraction skills to problems involving minuends with at least four digits	Recognizes the properties of 0 and 1 in multiplication Applies multiplication skills to problems involving up to three-digit factors Recognizes the properties of division of whole numbers Applies division skills to problems involving multiples of 10 (through 90) as divisors and up to three-digit dividends	Acquires skills for adding and subtracting with fractions and mixed numerals	
Equations and inequalities	Solves simple equations involving addition and subtraction	Solves simple equations involving multiplication and division	Solves selected word problems requiring a maximum of two different operations	
Money				Solves problems involving money values
Time				Classifies time zones Solves problems involving time

Level 5

Content				
Numeration	Expresses whole number numerals having up to 13 digits Expresses numbers in other systems	Expresses prime and composite numbers Expresses fractions in lowest terms	Expresses decimals through thousandths Expresses fractions as decimals Expresses the comparisons between two numbers	Expresses the relationships between metric prefixes and place value
Operations	Applies addition skills to whole numbers Applies subtraction skills to whole numbers Applies multiplication skills to problems involving numbers with at least four digits Applies division skills to problems in which the divisor has up to two digits	Acquires skills for adding with fractions Acquires skills for subtracting with fractions Begins multiplying fractional numbers	Acquires skills for adding with decimals Acquires skills for subtracting with decimals	
Money			Performs operations using one money value	
Time			Determines time and time periods Solves word problems involving time and requiring a combination of operations	

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Content		Level 6	
Numeration	Expresses whole number numerals in exponential	Expresses complex fractions	Expresses decimals through millionths
	Describes sets using set notation		Expresses relationships between fractions and decimals
	Expresses integer numerals		Expresses percents
Operations	Applies addition skills to whole numbers	Acquires skills for adding with mixed numerals	Applies addition skills to decimals
	Applies subtraction skills to whole numbers	Acquires skills for subtracting with mixed numerals	Acquires skills for subtracting with decimals
	Begins adding and subtracting integers	Acquires skills for multiplying fractions	Acquires skills for multiplying with decimals
	Applies multiplication skills to whole numbers	Acquires skills for dividing fractions	Acquires skills for dividing with decimals
	Applies division skills to problems in which the divisor has three or more digits	Acquires skills for dividing with mixed numerals	Solves problems which require naming a fraction as a decimal or a decimal as a fraction
			Solves proportions
			Solves word problems involving proportions and involving percents
Equations and inequalities	Solves mathematical sentences with at least three steps	Solves selected word problems	
Money		Performs operations using two money values	
Time		Determines time and time periods	

Source: Fairfax County Public Schools, *Mathematics program of studies* Fairfax Va.: Fairfax County Public Schools. Dept. of Instructional Services, Division of Curriculum Services, 1974, pp. 2-8. Reprinted in G. Wallace, & S.C. Larsen Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

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TABLE 12-2 Recommended Gradation of Arithmetic Processes

Mental Age	Whole Numbers	Fractions	Decimals
6–7	1. Counting 2. Identifying numbers to 200 3. Writing numbers to 100 4. Serial idea 5. Using numbers in activities of all kinds	1. Contacts in activity units and in simple measurements	1. Tens as basis of number system
7–8	1. Reading and writing numbers to 1,000 2. Concept development 3. Addition and subtraction facts to 6	1. Recognizing fractional parts	1. Place value 2. Zero as a place holder
8–9	1. Addition and subtraction facts and simple processes	1. Extending uses of fractions in measurements	1. Reading money values

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TABLE 12-2 *Continued*

Mental Age	Whole Numbers	Fractions	Decimals
	2. Multiplication and division facts through 3 3. Multiplication by one-place numbers 4. Related even division by one-place numbers	2. Finding part of a number	2. Addition and subtraction of dollars and cents 3. Multiplication and division of cents only
9–10	1. Completion of all multiplication and division facts 2. Uneven division facts 3. All steps with one-place multipliers and divisors	1. Extending use and meaning of fractions 2. Easy steps in addition and subtraction of like fractions by concrete and visual means 3. Finding a part of a number	1. Computing with dollars and cents in all processes
10–11	1. Two-place multipliers 2. Two-place divisors—apparent quotient need not be corrected 3. Zeros in quotients	1. Addition and subtraction of like fractions; also the halves, fourths, eighths	1. Addition and subtraction through hundredths
11–12	1. Three- and four-place multipliers 2. Two-place divisors; apparent quotient must be corrected	1. Addition, and subtraction of related fractions, as 1/3 and 1/6; also of easy unrelated types, 1/2 and 1/3 2. Multiplication 3. Division of whole numbers and mixed numbers by fractions	1. Addition and subtraction extended to thousandths 2. Multiplication and division of decimals by whole numbers

Source: Leo J. Brueckner, Guy L. Bond, *The diagnosis and treatment of learning difficulties*, © 1955, pp. 206–207. Reprinted by permission of Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Reprinted in G. Wallace & S. C. Larsen Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

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Table 3–4. *Typical Scope and Sequence of Elementary Mathematics*

	Grade						
	K	1	2	3	4	5	6
I. *Readiness for Mathematics*	•	•	•	•	•	•	•
Classification	•	•	•	•	•	•	•
One-to-one correspondence				•	•	•	•
One-to-many correspondence	•	•	•	•	•	•	•
Seriation or ordering	•	•	•	•	•	•	•
Space and spatial representation	•	•	•	•	•	•	•
Flexibility and reversibility	•	•	•	•	•	•	•
Conservation							
II. *Mathematical Concepts*	•	•	•	•	•	•	•
Same, equal, as much as	•	•	•	•	•	•	•
More than, greater, greatest, larger, largest	•	•	•	•	•	•	•
Bigger, biggest, longer, longest	•	•	•	•	•	•	•
Less than, fewer, fewest, smaller, smallest	•	•	•	•	•	•	•
Shorter, shorter, most, least	•	•	•	•	•	•	•
Enough, not enough, more than enough		•	•	•	•	•	•
Left, right		•	•	•	•	•	•
Above, below, up, down, next to, between		•	•	•	•	•	•
Putting together, add, plus		•	•	•	•	•	•
Take apart, take away, subtract, minus		•	•	•	•	•	•
How many in all? How many are left?			•	•	•	•	•
Odd, even			•	•	•	•	•
Open, closed			•	•	•	•	•
$=, >, <$							•
Factors, primes, multiples							
III. *Sets*	•	•	•	•	•	•	•
Definition	•	•	•	•	•	•	•
Elements of sets							
Kinds of sets	•	•	•	•	•	•	•
Identical	•	•	•	•	•	•	•
Equal and equivalent						•	•
Unequal and nonequivalent						•	•
Empty set			•	•	•	•	•
Union of sets (addition)			•	•	•	•	•
Subset (subtraction)			•	•	•	•	•
Intersection of sets						•	•

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	Grade K	1	2	3	4	5	6
IV. *Whole Numbers*							
Abstracting idea of cardinal number from equivalent set	•	•	•	•	•	•	•
Counting: one through ten	•	•	•	•	•	•	•
Concepts and counting: numbers above ten		•	•	•	•	•	•
Concept of zero	•	•	•	•	•	•	•
Skip counting by twos, threes, fives, tens		•	•	•	•	•	•
V. *Operations on Whole Numbers: Addition and Subtraction*							
Properties			•	•	•	•	•
Closure and nonclosure			•	•	•	•	•
Commutativity and noncommutativity			•	•	•	•	•
Associativity and nonassociativity			•	•	•	•	•
Inverse relation of addition and subtraction			•	•	•	•	•
Ways of conceptualizing			•	•	•	•	•
Union of sets or forming of subsets			•	•	•	•	•
Number line			•	•	•	•	•
Addition and subtraction with zero			•	•	•	•	•
Addition and subtraction with horizontal notation			•	•	•	•	•
Addition and subtraction with vertical notation			•	•	•	•	•
Addition and subtraction without regrouping	•	•	•	•	•	•	•
One-place numbers		•	•	•	•	•	•
Two-place numbers			•	•	•	•	•
Three-place numbers				•	•	•	•
Numbers with more than three digits					•	•	•
Addition and subtraction with regrouping				•	•	•	•
Two-place numbers					•	•	•
More than two-place numbers			•	•	•	•	•
Column addition					•	•	•
VI. *Operations on Whole Numbers: Multiplication and Division*							
Properties				•	•	•	•
Commutativity of multiplication					•	•	•
Associativity of multiplication						•	•
Distributive property of multiplication and division over addition				•	•	•	•
Inverse relation of multiplication and division					•	•	•
Ways of conceptualizing				•	•	•	•
Union of sets or partitioning into equivalent sets				•	•	•	•
Repeated addition or successive subtraction				•	•	•	•
Arrays					•	•	•
Number line				•	•	•	•
Multiplication and division with horizontal notation				•	•	•	•
Multiplication and division with vertical notation				•	•	•	•
Use of zero in multiplication and division				•	•	•	•
"One" as the identity element					•	•	•
Multiplication and division with 10's, 100's, etc.						•	•

(continued)

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Table 3–4. *Typical Scope and Sequence of Elementary Mathematics (continued)*

	Grade						
	K	1	2	3	4	5	6
Computation without regrouping							
One-place factor or divisor, one-place sums, dividend			•	•	•	•	•
One-place factor or divisor, two-place sums or dividends			•	•	•	•	•
Computation with regrouping							
One-place factor or divisor, two- or three-place sums or dividends				•	•	•	•
Two-place factors or divisiors, any number sums or dividends					•	•	•
Three- or four-place factors or divisors							•
Multiple multiplication				•	•	•	•
VII. *Fractions*							
Definition			•	•	•	•	•
Ways of conceptualizing				•	•	•	•
Number line				•	•	•	•
Arrays or subsets			•	•	•	•	•
Geometric figures							
Computation							
Addition and subtraction of simple fractions with common denominators					•	•	•
Addition and subtraction of simple fractions with mixed denominators						•	•
Addition and subtraction of mixed fractions with common denominators					•	•	•
Addition and subtraction of mixed fractions with mixed denominators						•	•
Multiplication and division							•
Decimal fractions							•
VIII. *Measurement*							
Measurement of length (inch, foot, yard, mile, metric)			•	•	•	•	•
Measurement of area (English and metric units)							•
Measurement of weight (ounce, pound, ton, metric units)						•	•
Measurement of liquids (cup, pint, quart, metric units)		•	•	•	•	•	•
Dry measures (quart, peck, bushel, metric units)					•	•	•
Measurement of quantity (dozen, gross)					•	•	•
Measurement of temperature (Fahrenheit, Celsius)					•	•	•
Measurement of time (clock, calendar)		•	•	•	•	•	•
Measure of money (coins, paper bills)			•	•	•	•	•
IX. *Geometry*							
Geometric shapes (circle, square, rectangle, triangle)		•	•	•	•	•	•
Geometric shapes (pentagon, hexagon, octagon, parallelogram)					•	•	•
Spatial relationships		•	•	•	•	•	•
Point, line, line segment, ray, intersection						•	•
Parallel line, curved line, straight line							•
Radius, diameter						•	•
Angles, arc degrees							•
Closed-line plane, open-line plane							•
Area and perimeter							•
Three-dimensional shapes (sphere, cube, cone)							•

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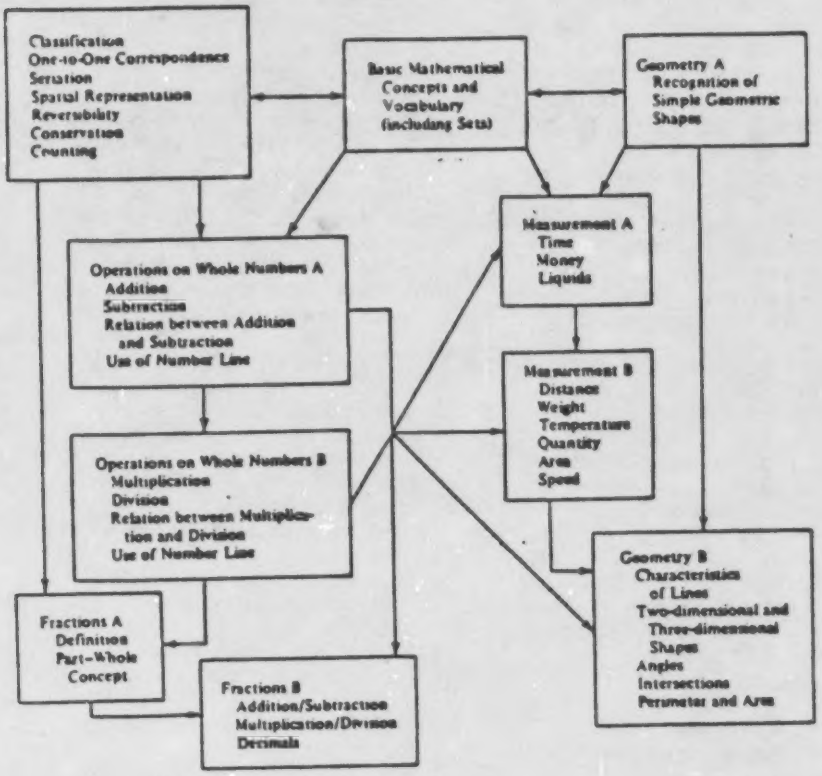
Source: Bartel, N. Problems in mathematics achievement. In D.D. Hammill & N. R. Bartel (Eds.) Teaching children with learning and behavior problems. 2nd edition. Boston: Allyn and Bacon, 1978.

Figure 3–2. *Summary of Scope and Sequence in Typical Elementary Mathematics*



Source: Bartel, N. Problems in mathematics achievement. In D.D. Hammill & N.R. Bartel (Eds.) Teaching children with learning and behavior problems. 2nd edition. Boston: Allyn and Bacon, 1978.

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TABLE 12–5 Frequent Arithmetic Habits Observed in Elementary Students

Addition

Errors in combinations
Counting
Added carried number last
Forgot to add carried number
Repeated work after partly done
Wrote number to be carried
Irregular procedure in column
Carried wrong number
Grouped two or more numbers
Split numbers into parts
Used wrong fundamental operation
Lost place in column
Depended on visualization
Disregarded column position
Omitted one or more digits
Errors in reading numbers
Dropped back one or more tens
Derived unknown combination from familiar one
Disregarded one column
Error in writing answer
Skipped one or more decades
Carried when there was nothing to carry
Used scratch paper
Added in pairs, giving last sum as answer
Added same digit in two columns
Wrote carried number in answer
Added same number twice

Subtraction

Errors in combinations
Did not allow for having borrowed
Counting
Errors due to zero in minuend
Said example backwards
Subtracted minuend from subtrahend
Failed to borrow; gave zero as answer
Added instead of subtracted
Error in reading
Used same digit in two columns
Derived unknown from known combination
Omitted a column
Used trial-and-error addition
Split numbers
Deducted from minuend when borrowing was not necessary
Ignored a digit
Deducted 2 from minuend after borrowing
Error due to minuend and subtrahend digits being same
Used minuend or subtrahend as remainder
Reversed digits in remainder
Confused process: which division or multiplication
Skipped one or more decades
Increased minuend digit after borrowing
Based subtraction on multiplication combination

Multiplication

Errors in combinations
Error in adding the carried number
Wrote rows of zeros
Carried a wrong number
Errors in addition
Forgot to carry
Used multiplicand as multiplier
Error in single zero combinations, zero as multiplier
Errors due to zero in multiplier
Used wrong process—added
Error in single zero combinations, zero as multiplicand
Confused products when multiplier had two or more digits
Repeated part of table
Multiplied by adding
Did not multiply a digit in multiplicand
Based unknown combination on another
Errors in reading
Omitted digit in product
Errors in writing product
Errors in carrying into zero
Counted to carry
Omitted digit in multiplier

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TABLE 12-5 *Continued*

Multiplication (Continued)	
Errors due to zero in multiplicand	Split multiplier
Error in position of partial products	Wrote wrong digit of product
Counted to get multiplication combinations	Multiplied by same digit twice
Illegible figures	Reversed digits in product
Forgot to add partial products	Wrote tables

Division	
Errors in division combinations	Derived unknown combinations from known one
Errors in subtraction	Had right answer, used wrong one
Errors in multiplication	Grouped too many digits in dividend
Used remainder larger than divisor	Error in reading
Found quotient by trial multiplication	Used dividend or divisor as quotient
Neglected to use remainder within problem	Found quotient by adding
Omitted zero resulting from another digit	Reversed dividend and divisor
Counted to get quotient	Used digits of divisor separately
Repeated part of multiplication table	Wrote all remainders at end of problem
Used short division form for long division	Misinterpreted table
Wrote remainders within problem	Used digit in dividend twice
Omitted zero resulting from zero in dividend	Used second digit of divisor to find quotient
Omitted final remainder	Began dividing at units digit of dividend
Used long division form for short division	Split dividend
Said example backwards	Counted in subtracting
Used remainder without new dividend figure	Used too large a product
	Used endings to find quotient

Source: G. T. Buswell & Leonore John. *Diagnostic Studies in Arithmetic.* Chicago: University of Chicago Press, 1926. Used with permission of the publisher.

Reprinted in G. Wallace and S. C. Larsen Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

Reisman Sequential Assessment Mathematics Inventory (SAMI)

The Sequential Assessment Mathematics Inventory (SAMI) presented here is comprised of four parts: Part 1 for grades kindergarten, one, and two; Part 2 for grades three and four; Part 3 for grades five and six; and Part 4 for grades seven and eight. SAMI is also appropriate at higher grade levels for older students who lack basic mathematics knowledge. It may be necessary in some cases to administer a lower level part of SAMI to those students who cannot perform successfully on even the initial items comprising the part of the assessment that is equivalent to their grade in school (see discussion on underachiever, page 49).

All items on this diagnostic tool are keyed to eighteen mathematics ideas. This is to help you quickly identify those areas which are problematic to a student or group of students. Also presented are selected answers to items on SAMI. Once the areas of weakness have been identified, specific performance objectives for instruction may be developed. The areas of strength aid in selecting instructional procedures that have proven effective with the particular student(s). In addition to analyzing results of SAMI, it must be remembered that day-to-day observations are important. The student's emotional aspects must be considered as well as his or her cognitive activities.

The performance objectives were used as the structure for diagnostic items on SAMI. These items may also be used as instructional activities forming the instructional component of the Diagnostic Teaching Cycle (see page 7).

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The SAMI items are categorized as to type of learning and mode of representing curriculum or content for each item (see page 132). Preceding this categorization is the Table of Specification that underlies the Sequential Assessment Mathematics Inventory, Parts 1, 2, 3, and 4. Individual and Class Profiles are presented following the type of learning summary (see pages 134–143 for profile formats).

Performance Objectives Underlying the SAMI

Part 1: Grades K, 1, and 2

Content	*Performance Objective*
1. Proximity	a. To place an object close to a given object. b. To draw a figure close to a given figure.
2. Spatial Relations	a. To complete a puzzle. b. To move an object upwards in space (down). c. To place an object under (over) a given object. d. To place an object within a given enclosure. e. To place objects in an indicated order. f. To place an object between two given objects.
3. Size	a. To select the larger (smaller) of two objects. b. To arrange objects from shortest to longest.
4. Numeration	a. To write the digits 0 to 9. b. To indicate the cardinal number property of a set by selecting the appropriate flannel board numerals. c. To write the numeral which represents the cardinality of a set.
5. Cardinality	a. To match objects in sets showing one-to-one correspondence. b. To enumerate objects in a set.

Content	*Performance Objective*
6. Classification	a. To describe what is alike about two or more objects (or sets). b. To arrange objects into groups so all objects within a group are alike in some way.
7. Equivalent Sets	a. To label equivalent sets with the numeral that indicates their equivalence. b. To draw a set that is equivalent to a given set. c. To use the = symbol when appropriate.
8. Nonequivalence	a. To select the nonequivalent set from a group of sets. b. To draw a set that has a greater number of objects than a given set. c. To use correctly the inequality symbols (<, >).
9. Addition	a. To record an addition example shown on a number line. b. To record an addition example shown by unionizing sets. c. To show the commutative property with sets, pictures, and/or addition equations. d. To show the associative property with sets, pictures, and/or equations. e. To show the additive identity with sets, pictures, and/or equations. f. To add on an abacus. g. To compute without renaming.
10. Multiplication	a. To show union of disjoint equivalent sets as a model for simple multiplication examples. b. To record simple multiplication examples shown with sets and/or pictures. c. To relate the place value idea to multiplication.
11. Place Value	a. To show ten units as one ten. b. To show ten tens as one hundred.

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Content	*Performance Objective*
	c. To describe why 9 + 1 may not be expressed as a 1-digit numeral in base ten.
	d. To compare our place value notational system with an ancient nonpositional system.
	e. To relate multiplication to generating place values.
	f. To enumerate beads on a nine bead abacus showing that the 9 + 1 sum is shown by a move to the tens position.
	g. To employ place value in addition and multiplication computations when recording the vertical algorithms.
12. Subtraction	a. To employ place value in subtraction when recording the vertical algorithm.
	b. To record simple subtraction examples shown with sets and/or pictures (no renaming).

*Part 2: Grades 3 and 4**

Prerequisite: Ability to perform Part 1 of SAMI.

Content	*Performance Objective*
12. Subtraction	c. To show subtraction as the inverse relation to addition.
	d. To record the subtraction problem for simple verbal problems (no renaming).
	e. To complete an addition-subtraction grid.
	f. To subtract on a nine bead abacus (no renaming).
	g. To relate renaming one ten as ten units to the addition operation where ten units are renamed as one ten.
	h. To subtract with renaming.
9. Addition of Whole Numbers	h. To add with renaming using sets, pictures, and/or algorithms.

* Note: Part 2, Grades 3 and 4, also includes Objectives 6 through 12b.

Content	*Performance Objective*
	i. To record the addition problem for related verbal problems, with and without renaming.
10. Multiplication	d. Write multiplication equations that describe sets and/or pictures.
	e. Record multiplication equations shown on number lines.
	f. Write the factors for a number.
	g. To show the Distributive Property of Multiplication over Addition with sets, pictures, and/or equations.
13. Division	a. To show division on a number line.
	b. To show uneven and even division with dot arrays.
	c. To relate division as the inverse operation of multiplication.
	d. To show division as repeated subtraction of the same number.
	e. To compute simple division problems.
14. Prime Numbers	a. To write prime numbers.
	b. To discriminate prime from composite numbers.
	c. To write a composite number as a product of its primes.
10. Multiplication of Whole Numbers	h. Write the lowest common multiple (LCM) of two or more numbers.
	i. Write the greatest common factor (GCF) of two or more numbers.
15. Fractions	a. To divide a figure into a designated number of parts.
	b. To write the number of fractional parts into which a whole has been divided.
	c. Write the appropriate numerator to show how many parts of the whole figure is being considered.
	d. Write the appropriate numerator and denominator for a group of objects (either real or pictured).
	e. Write equivalent fraction names for the number one.

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Content	Performance Objective
	f. Show fractions on a number line. g. Write equivalent fractions from concrete, and/or picture representations. h. Write equivalent fractions for a given fraction. i. Perform simple multiplication of fractions.

*Part 3: Grades 5 and 6**

Prerequisite: Ability to perform Part 2 of SAMI.

Content	Performance Objective
10. Multiplication of Whole Numbers	j. To complete a multiplication grid.
15. Fractions	j. To multiply mixed fractions. k. To divide fractions. l. To add fractions with like and unlike denominators. m. To subtract fractions with like and unlike denominators.

Content	Performance Objective
16. Decimals	a. Divide units by ten to obtain decimal fractions. b. To add and subtract decimals with and without renaming. c. To multiply decimals. d. To divide decimals. e. To convert fractions to their equivalent decimal form. f. To convert decimals to their equivalent fraction form. g. To relate percent to decimal fractions. h. To solve percent problems.
17. Geometry	a. Find the supplement and complement of angles. b. Graph designated points on an x,y axis. c. Use metric measures. d. Find the perimeter of a given figure.

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* Note: Part 3, Grades 5 and 6, also includes Objectives 9c through 15l.

*Part 4: Grades 7 and 8**

Prerequisites: Ability to perform Part 3 of SAMI.

Content	Performance Objective
17. Geometry	e. To find the volume of a given figure. f. To find the diameter of a circle when the radius is given. g. To find the circumference of a circle when the radius is given. h. To find the area of a given figure. i. To draw a simple closed curve. j. To show translations and rotations. k. To identify figures that have line symmetry.
18. Probability and Statistics	a. To write as a fraction the probability of a given event to occur. b. To interpret bar graphs. c. To interpret descriptive statistics.

Directions for Administering SAMI

Read instructions to the student when necessary unless the item is testing reading comprehension, as in verbal problem solving. For young children or for those who have had little success in mathematics, you may wish to copy the test items on index cards and administer only one item at a time. This procedure will help to eliminate the possibility of the child's becoming overwhelmed at the sight of a long-looking test. Proceed from the lowest level of learning to the highest so that the student will experience success as he works his way up to the higher levels of learning.

Scoring of SAMI

In scoring items on the Sequential Assessment Mathematics Inventory, an item is counted correct only if all of its components are answered correctly. This helps to compensate for a child obtaining parts of an item correct by chance or by guessing.

* Note: Part 4, Grades 7 and 8, also includes Objectives 13a through 17d.

If the student answers 80 percent of the questions in one part of the Inventory correctly, go on to the next part. If the student does not reach the 80 percent criterion, go back to the next lower grade level test (that is, go from Part 2 to Part 1) in order to identify the level at which he or she is performing.

SAMI Part 1: Grades K–2

4a. Fill in the missing numbers.

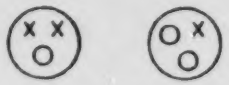
0 ___ ___ 3

___ 5 ___ ___ ___ 9

4c. Write the number to show that four objects are in the set.

_____

7a. Write the correct number that shows how many are in each set.

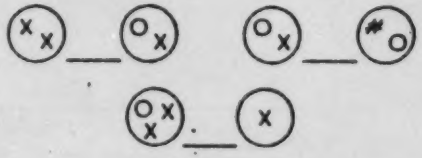


_____ _____

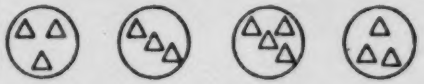
7b. Draw the same number of circles in Set B as are in Set A.

Set A Set B

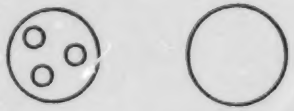
7c. Write the equal sign where needed.



8a. Mark X on the set that is different in number.



8b. Draw a set that is greater in number than this set.



8c. Fill in the correct sign to make a true sentence.

6 _____ 9 4 _____ 2

3 _____ 5 8 _____ 9

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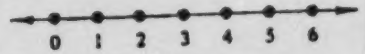
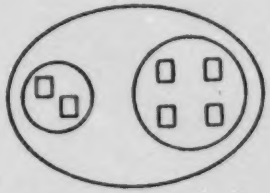
9a. Show that 2 + 3 = 5 on the number line.



9b. How many objects are there altogether?



_____

9c. Complete the following to make the sentences true.

2 + 3 = _____ +2

□ + ⊞ = ⊞ + ___

9d. Complete the following to make the sentences true.

(2 + 3) + 4 = 2 +(3 + ___)

(___ + 6) + 7 = 8 +(___ + 7)

9e. Complete the following.

3 + ___ = 3

9g. Add the following.

41	24	17
+23	+13	+62

10a. Using the bags of candy, fill in the numbers below to tell how many pieces of candy there are.

___ + ___ + ___ = 6

3 twos = 6

3 × ___ = ___

10b. Write the multiplication sentence for this picture.

○○○ ○○○ ○○○ ○○○

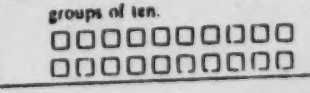
_____

10c. Complete the following place value chart.

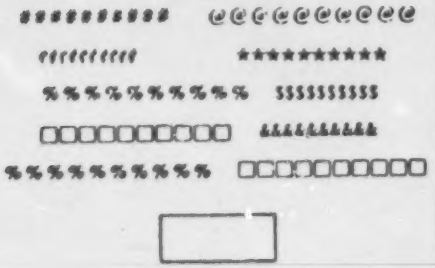
thousands _____ tens units

_____ × _____ × _____ × _____

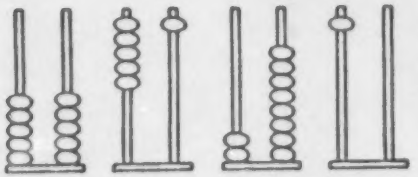
11a. Show how many tens by circling groups of ten.



11b. What number is ten groups of ten?
Write the number in the box below.



11f. Mark the abacus that shows 9 + 1.



11g. Complete the following.

$$\begin{array}{r} 32 \\ \times 24 \\ \hline \end{array} \qquad \begin{array}{r} 36 \\ \times 23 \\ \hline \end{array}$$

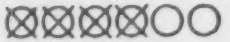
12a. The problem 65 − 23 = ☐ can be written as

$$\begin{array}{r} 65 \\ -23 \\ \hline 42. \end{array}$$

In the box below, write the following problem this way and find the answer.

47 − 32 = ☐

12b. Write a subtraction sentence to tell about the picture.



Note: Part 1, Grades K–2, should also include items based upon performance Objectives 1 through 3b, which are at the concrete level rather than paper-pencil.

12c. Complete the following.

4 + 7 = _____

_____ − 7 = 4

_____ − 4 = 7

12d. Mark the sentence that solves the problem. Sam has 5 marbles. Jan takes 3 marbles away. How many marbles does Sam have left?

5 + 3 = 8 5 − 3 = 2 3 + 2 = 5

12e. Complete the grid.

+/−	6	3	2
8	14		10
4	10	7	
		12	11

12h. Complete the following.

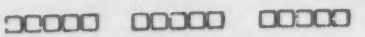
$$\begin{array}{r} 62 \\ -48 \\ \hline \end{array} \qquad \begin{array}{r} 35 \\ -19 \\ \hline \end{array}$$

9h. Complete the following.

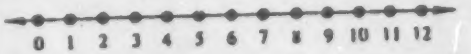
$$\begin{array}{r} 37 \\ +26 \\ \hline \end{array} \qquad \begin{array}{r} 59 \\ +74 \\ \hline \end{array}$$

9i. Larry had 13 rocks in a sack. On his way home from school, he picked up 9 more rocks. How many rocks does he now have?

10d. Write the multiplication sentence for the picture.



10e. Show that 3 × 3 = 9 on the number line.



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10f. List factors for 18, greater than 1.

18 = ___ × ___

18 = ___ × ___ × ___

10g. Mark X on the correct number sentences.

$5(3 + 6) = 5(3) + 5(6)$

$5 + (3 \times 6) = (5 + 3) \times (5 \times 6)$

$5(3 \times 6) = 5(3) \times 5(6)$

$\square(^{\circ} + @) = \square^{\circ} + \square@$

13a. Show on a number line the number sentence 8 ÷ 2 = 4.

13b. Group the array to show 17 ÷ 2 = ____

13c. Complete the following number sentences.

18 ÷ 3 = ____

____ × 3 = 18

13d. Show on a number line 15 ÷ 5 = _____.

13e. Complete the following.

8 ÷ 2 = ____

6 ÷ 3 = ____

$3\overline{)13}$

14a. Write the prime numbers between 1 and 25.

____ ____ ____ ____ ____

____ ____ ____ ____

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14b. Circle the prime numbers.

1 6 2 8 11 18 22

14c. Write 24 as a product of primes.

24 = ___ × ___ × ___ × ___

10h. Write the lowest common multiple (LCM) of 8 and 6.

_____

10i. Write the greatest common factor (GCF) for 36 and 24.

_____

15a. Divide the figure into 4 equal size parts.

15b. Write the number to show how many parts the figure has been divided into.

15c. Write the numerator to show how many parts are shaded.

___

15d. Write a fraction to name the shaded part of the group below.

___

15e. Write 3 fraction names for the number 1.

_____ _____ _____

15f. Show the fraction 5/6 on the number line below.

15g. Show on a number line that 1/2 = 2/4.

15h. Write three equivalent fraction names for 1/2.

$\frac{1}{2} = \_\_\_\_ = \_\_\_\_ = \_\_\_\_$

15i. Complete the following.

$2/3 \times 4/5 =$

$7/8 \times 5/6 =$

Note: Part 2, Grades 3–4, should also include items based upon performance Objectives 6 through 12b.

10j. Complete the following multiplication grid.

×	5	7	3
4	20		12
8			
6			

15j. Complete the following.

$5\frac{1}{4}$ ×3

$3\frac{1}{2} \times 2\frac{1}{4} =$

15k. Complete the following.

$\frac{7}{12} + \frac{3}{4} =$

$\frac{35}{27} \div \frac{7}{3} =$

15l. Complete the following.

$\frac{3}{4} + \frac{2}{4}$

$\frac{7}{8} + \frac{2}{3}$

15m. Complete the following.

$\frac{3}{3} - \frac{1}{3} = \_\_\_\_$

$\frac{6}{8} - \frac{1}{8} = \_\_\_\_$

16a. Write in decimal form.

$2 \div 10 = \_\_\_\_$

$7 - 100 = \_\_\_\_$

16b. Complete the following.

2.44 +2.35

3.74 +1.29

4.74 − .35

16c. Complete the following.

.23 × .2

.43 ×.12

7.3 ×2.4

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16d. Divide the following decimals.

.36 ÷ .6 = _____

.24 ÷ .8 = _____

.7)48.3

16e. Write the following fractions as decimals.

3/6 = _____ 5/10 = _____

3/4 = _____ 2/3 = _____

16f. Write the decimals below as fractions.

.23 = _____ .25 = _____

.3 = _____

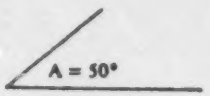
16g. Write 75 % as a decimal.

75 % = _____

16h. Write 30 % of 17.

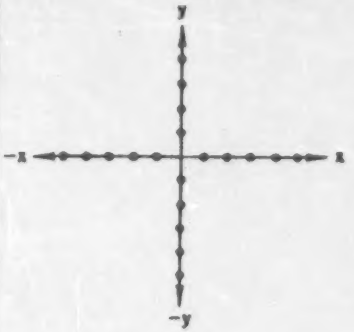
30 % of 17 = _____

17a. Find the supplement of angle A.



_____

17b. Graph the following points on the x,y axis below. (3,4), (2,−2), (−1,3).

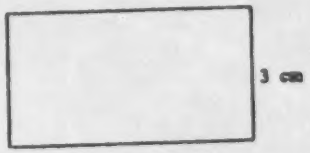


17c. Complete the following.

6 cm = _____ mm

3 km = _____ m

17d. Find the perimeter of the given rectangular region.



Note: Part 3, Grades 5–6, should also include items based upon performance Objectives 9c through 15i.

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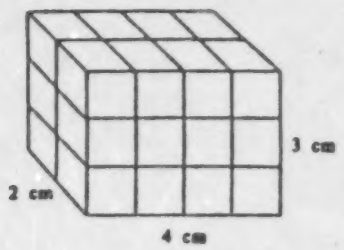
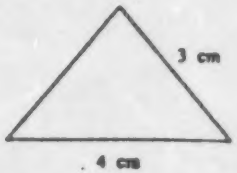
17e. Find the volume of the following figure.



_____

17h. Find the area of the triangular region.



_____

17i. Find the diameter of the given circle.

_____

17g. Find the circumference of a circle whose radius is 6 cm.

_____

17l. Draw a simple closed curve.

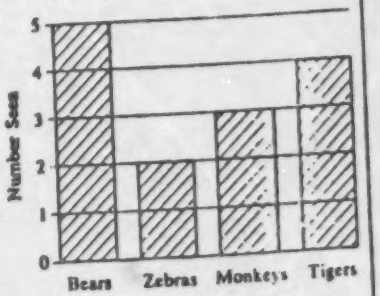
17j. Draw this figure in a clockwise 1/4 rotation.

17k. Mark X on the figures that have line symmetry.

18a. Write the probability in fraction form for a coin tossed ten times to come up heads.

_____

18b. On a visit to the zoo, Johnny saw bears, zebras, monkeys, and deers. How many bears and how many tigers did he see as shown on the graph below?



Bears _____ Tigers _____

18c. Following are test scores for 3 students, Ann, Barbara, and Catherine. Who has the highest mean score? What is this mean?

Ann's scores: 89, 72,80,56,98

Barbara's score: 72,93,56

Catherine's scores: 90,91,90,92,35

Student with highest mean is:

Mean = _____

Note: Part 4, Grades 7–8, should also include items based upon performance Objectives 13a through 17d.

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Individual SAMI Profile

The following is a suggested format for obtaining a diagnostic profile of an individual student's performance on the SAMI. The profile gives the teacher an "at-a-glance" picture of the student's strengths and weaknesses in areas tapped by SAMI.

Individual SAMI Profile

Name _____ Grade in School _____

CA _____ MA _____ Date _____

Part 1: Grades K–2

Step 1: Circle incorrect items.

A. Proximity, Spatial Relations, Size	B. Numeration	C. Cardinality, Classification, Equivalence, Nonequivalence	D. Operations on Whole Numbers
1a,1b,2a,2b,2c,2d,2e,2f,3a,3b,	4a,4b,4c,7a,7c	5a,5b,6a,6b,7b,8a,8b,8c	9a,9b,9c,9d,9e,9f,9g,10a,10b,10c, 11a,11b,11c,11d,11e,11f,11g,12a, 12b

Step 2: Count the number of correct items (not circled) for each group.

Step 3: To find percent of items correct within each group, first circle number of items correct in each box below, and then circle equivalent percent correct.

A.

No. of Items Correct	Equi. % Correct
10	100
9	90
8	80
7	70
6	60
5	50
4	40
3	30
2	20
1	10

B.

# Correct	% Correct
5	100
4	80
3	60
2	40
1	20

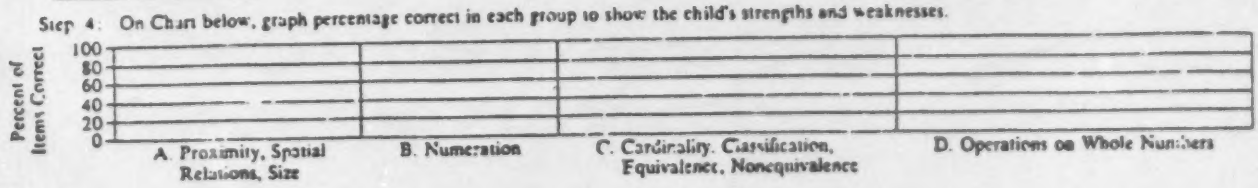
C.

# Correct	% Correct
8	100
7	88
6	75
5	63
4	50
3	38
2	25
1	13

D.

No. of Items Correct	Approx. % Correct	# Correct	Approx. % Correct
19	100	9	48
18	95	8	42
17	90	7	37
16	85	6	32
15	80	5	27
14	75	4	21
13	69	3	16
12	64	2	11
11	58	1	5
10	53		

Step 4: On Chart below, graph percentage correct in each group to show the child's strengths and weaknesses.



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Individual SAMI Profile

Part 2: Grades 3–4

Name _____ Grade in School _____

CA _____ MA _____ Date _____

Step 1: Circle incorrect items.

A. Cardinality, Classification, Equivalence, Nonequivalence

6a, 6b, 7b, 8a, 8b, 8c

B. Operations on Whole Numbers

9a, 9b, 9c, 9d, 9e, 9f, 9g, 9h, 9i, 10a, 10b, 10c, 10d, 10e, 10f, 10g, 10h, 10i, 11a, 11b, 11c, 11d, 11e, 11f, 11g, 12a, 12b, 12c, 12d, 12e, 12f, 12g, 12h, 13a, 13b, 13c, 13d, 13e

C. Prime Numbers

14a, 14b, 14c

D. Fractions

15a, 15b, 15c, 15d, 15e, 15f, 15g, 15h, 15i

Step 2: Count the number of correct items (not circled) for each group.

Step 3: To find percent of items correct within each group, first circle number of items correct in each box below, and then circle equivalent percent correct.

A.

# Corr.	% Corr.
6	100
5	85
4	68
3	51
2	34
1	17

B.

# Corr.	% Corr.	# Corr.	% Corr.	# Corr.	% Corr.	# Corr.	% Corr.
38	100	30	79	20	52	10	26
37	97	29	75	19	49	9	23
36	95	28	73	18	47	8	21
35	91	27	70	17	44	7	18
34	89	26	68	16	42	6	16
33	87	25	65	15	39	5	13
32	84	24	62	14	36	4	10
31	81	23	60	13	34	3	8
		22	57	12	31	2	5
		21	55	11	29	1	3

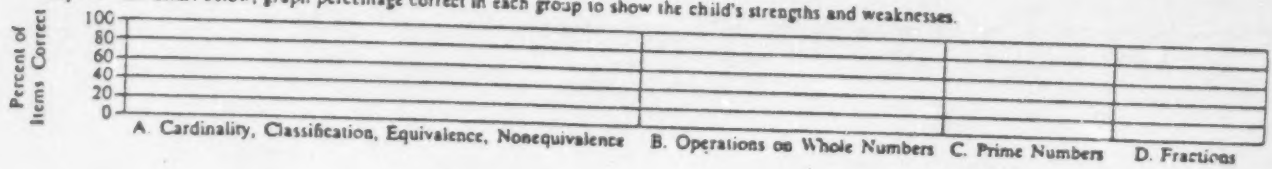
C.

# Corr.	% Corr.
3	100
2	66
1	33

D.

# Corr.	% Corr.
9	100
8	88
7	77
6	66
5	55
4	44
3	33
2	22
1	11

Step 4: On Chart below, graph percentage correct in each group to show the child's strengths and weaknesses.



Individual SAMI Profile

Part 3: Grades 5–6

Name _____ Grade in School _____

CA _____ MA _____ Date _____

Step 1: Circle incorrect items.

A. Operations on Whole Numbers

9c, 9d, 9e, 9f, 9g, 9h, 9i, 10a, 10b, 10c, 10d, 10e, 10f, 10g, 10h, 10i, 10j, 11a, 11b, 11c, 11d, 11e, 11f, 11g, 12a, 12b, 12c, 12d, 12e, 12f, 12g, 12h, 13a, 13b, 13c, 13d, 13e

B. Prime Numbers

14a, 14b, 14c

C. Fractions

15a, 15b, 15c, 15d, 15e, 15f, 15g, 15h, 15i, 15j, 15k, 15l, 15m

D. Decimals

16a, 16b, 16c, 16d, 16e, 16f, 16g, 16h

E. Geometry

17a, 17b, 17c, 17d

Step 2: Count the number of correct items (not circled) for each group.

Step 3: To find percent of items correct within each group, first circle number of items correct in each box below, and then circle equivalent percent correct.

A.

# Corr.	% Corr.	# Corr.	% Corr.	# Corr.	% Corr.	# Corr.	% Corr.
37	100	27	73	17	46	7	19
36	97	26	70	16	43	6	16
35	95	25	68	15	41	5	14
34	92	24	65	14	38	4	11
33	89	23	62	13	35	3	8
32	86	22	59	12	32	2	5
31	84	21	57	11	30	1	3
30	81	20	54	10	27		
29	78	19	51	9	24		
28	76	18	49	8	22		

B.

# Corr.	% Corr.
3	100
2	66
1	33

C.

# Corr.	% Corr.
13	100
12	92
11	85
10	77
9	69
8	62
7	54
6	46
5	38
4	31
3	23
2	15
1	8

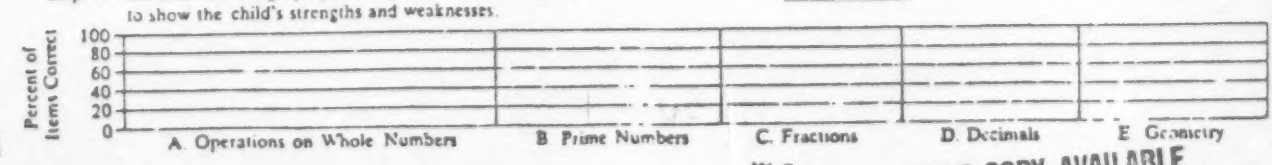
D.

# Corr.	% Corr.
8	100
7	88
6	75
5	63
4	50
3	38
2	25
1	13

E.

# Corr.	% Corr.
4	100
3	75
2	50
1	25

Step 4: On Chart below, graph percentage correct in each group to show the child's strengths and weaknesses.



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Individual SAMI Profile

Part 4: Grades 7–8

Name _____ Grade in School _____

CA _____ MA _____ Date _____

Step 1: Circle incorrect items.

A. Operations on Whole Number	B. Prime Numbers	C. Fractions	D. Decimals	E. Geometry	F. Probability and Statistics
13a,13b,13c,13d,13e	14a,14b,14c	15a,15b,15c,15d,15e,15f,15g,15h,15i,15j,15k,15l,15m	16a,16b,16c,16d,16e,16f,16g,16h	17a,17b,17c,17d,17e,17f,17g,17h,17i,17j,17k	18a, 18b, 18c

Step 2: Count the number of correct items (not circled) for each group.

Step 3: To find percent of items correct within each group, first circle number of items correct in each box below, and then circle equivalent percent correct.

A.

No. of Items Correct	Equi. % Correct
5	100
4	80
3	60
2	40
1	20

B

# Correct	% Correct
3	100
2	66
1	33

C.

# Correct	% Correct
13	100
12	92
11	85
10	77
9	69
8	62
7	54
6	46
5	38
4	31
3	23
2	15
1	8

D.

# Correct	% Correct
8	100
7	88
6	75
5	63
4	50
3	38
2	25
1	13

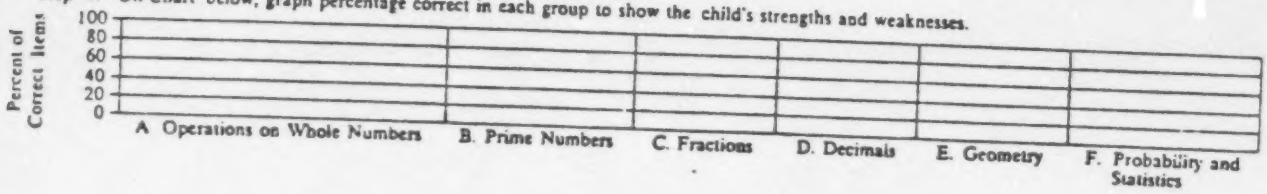
E.

# Correct	% Correct
11	100
10	91
9	82
8	73
7	64
6	55
5	46
4	36
3	27
2	18
1	9

F.

# Correct	% Correct
3	100
2	66
1	33

Step 4: On Chart below, graph percentage correct in each group to show the child's strengths and weaknesses.



Reisman Sequential Assessment Mathematics Inventory 139

Class SAMI Profile

The teacher may wish to know how the class as a whole achieved on each of the performance objectives that underlie the SAMI items. Following is a suggested summary sheet for showing the number of students who missed specific items

Source: Reisman, F. K. A guide to the diagnostic teaching of arithmetic. 2nd edition. Columbus, Ohio: Charles E. Merrill Publishing Company, 1978

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Arithmetic diagnostic test

Number concepts

Circle the correct number of objects

2 = (○○) or ○○○
5 = (△△△△△) or △△△
1 = (◡̈) or ◡̈ ◡̈ ◡̈
3 = ☆☆☆ or (☆☆☆)
4 = (□□□□) or □□

6 = ▽ or (▽▽▽▽▽▽)
9 = (○○○○○○○○○) or ○○○○○○
8 = □□ or (□□□□□□□□)
3 = (☆☆☆) or ☆☆
7 = (○○○○○○○) or ○○○○○○○

Give a number to name each group

9 = ○○○○○○○○○
3 = △△△
7 = ◡̈ ◡̈ ◡̈ ◡̈ ◡̈ ◡̈ ◡̈
1 = ☆
3 = □□□

8 = ▽▽▽▽▽▽▽▽
2 = ▽▽
4 = ☆☆☆☆
6 = ○○○○○○
5 = ▯▯▯▯▯

Addition

Basic addition facts

1	5	1	7	2	4	3	9	3	2
+1	+6	+4	+3	+8	+4	+4	+0	+6	+5
2	11	5	10	10	8	7	9	9	7

Noncarrying addition with two or more digits

11	29	64	271	181	123	671	132	3052	6007
+12	+50	+32	+11	+17	+456	+222	+365	+4013	+1101
23	79	96	282	198	579	893	497	7065	7108

Carrying addition

16	24	17	14	38	69	253	173	4869	6576
+5	+9	+6	+37	+44	+69	+48	+268	+5850	+4982
21	33	23	51	82	138	301	441	10719	11558

Subtraction

Basic subtraction facts

2	9	6	4	8	7	3	5	7	9
-1	-7	-5	-4	-2	-3	-2	-1	-5	-4
1	2	1	0	6	4	1	4	2	5

Nonborrowing subtraction with two or more digits

21	66	49	99	76	88	52	395	1869	4678
-10	-21	-17	-21	-32	-48	-40	-174	-1216	-2524
11	45	31	78	44	40	12	221	653	2154

Borrowing subtraction

10	17	25	36	71	60	143	281	5247	2802
-1	-9	-6	-28	-24	-14	-86	-93	-1874	-1355
9	8	19	8	47	46	57	188	3373	1447

Multiplication

Basic multiplication facts

0	1	3	4	6	8	10	5	4	7
x4	x1	x2	x7	x3	x9	x7	x9	x5	x8
0	1	6	28	18	72	70	45	20	56

Multiplication by one digit without carrying

16	22	23	41	11	220	887	4,341	1,132	2,424
x0	x4	x2	x3	x7	x4	x1	x2	x3	x2
0	88	46	123	77	880	887	8682	3396	4848

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Multiplication by one digit with carrying

$24 \times 3 = 72$ $19 \times 2 = 38$ $35 \times 3 = 105$ $496 \times 6 = 2,976$ $780 \times 5 = 3,900$ $356 \times 4 = 1,424$ $127 \times 7 = 889$ $2,459 \times 8 = 19,672$ $3,078 \times 9 = 27,702$ $5,054 \times 6 = 30,324$

Multiplication with two digits

$17 \times 20 = 340$ $24 \times 30 = 720$ $65 \times 52 = 3,380$ $38 \times 16 = 608$ $567 \times 28 = 15,876$ $123 \times 23 = 2,829$ $479 \times 64 = 30,656$ $586 \times 43 = 25,198$ $8,098 \times 37 = 299,626$ $6,049 \times 95 = 574,655$

Division

Basic division facts

$1\overline{)6}$ $2\overline{)4}$ $3\overline{)9}$ $4\overline{)8}$ $7\overline{)0}$ $5\overline{)5}$ $8\overline{)16}$ $9\overline{)27}$ $4\overline{)28}$ $5\overline{)20}$

One-step division with remainders using one-digit divisor

$4\overline{)5}$ r 1 $2\overline{)9}$ r 1 $4\overline{)7}$ r 3 $3\overline{)8}$ r 2 $5\overline{)7}$ r 2 $6\overline{)23}$ r 5 $8\overline{)26}$ r 2 $9\overline{)82}$ r 1 $7\overline{)58}$ r 2 $6\overline{)19}$ r 1

Two or more step division without remainders using one-digit divisor

$2\overline{)38}$ $7\overline{)84}$ $6\overline{)96}$ $5\overline{)75}$ $8\overline{)96}$ $4\overline{)92}$ $3\overline{)75}$ $4\overline{)964}$ $5\overline{)1050}$ $8\overline{)1,768}$

Two or more step division with remainders using one-digit divisor

$1\overline{)51}$ r 1 $5\overline{)73}$ r 3 $7\overline{)96}$ r 5 $6\overline{)82}$ r 4 $3\overline{)75}$ r 1 $4\overline{)99}$ r 3 $8\overline{)959}$ r 5 $4\overline{)713}$ r 1 $3\overline{)5620}$ r 1 $4\overline{)6011}$ r 3

One-step division without remainders using two-digit divisor

$8\overline{)80}$ $6\overline{)78}$ $2\overline{)72}$ $44\overline{)88}$ $3\overline{)75}$ $7\overline{)427}$ $5\overline{)375}$ $63\overline{)126}$ $4\overline{)328}$ $9\overline{)729}$

One-step division with remainders using two-digit divisor

$11\overline{)23}$ r 1 $15\overline{)46}$ r 1 $17\overline{)87}$ r 2 $28\overline{)60}$ r 9 $33\overline{)98}$ r 32 $43\overline{)176}$ r 18

$61\overline{)110}$ r 6 $72\overline{)500}$ r 68 $68\overline{)402}$ r 62 $93\overline{)887}$ r 60

Two or more step division without remainders using two-digit divisor

$10\overline{)220}$ 22 $12\overline{)240}$ 20 $18\overline{)720}$ 40 $14\overline{)294}$ 21 $23\overline{)713}$ 31 $48\overline{)528}$ 11

$15\overline{)645}$ 43 $25\overline{)1050}$ 42 $33\overline{)20,460}$ 620 $64\overline{)46,936}$ 734

Two or more step division with remainder using two-digit divisor

$15\overline{)278}$ 21 r 5 $16\overline{)591}$ 36 r 15 $24\overline{)602}$ 20 r 22 $48\overline{)1,017}$ 22 r 21 $68\overline{)4,023}$ 61 r 55

$39\overline{)7,492}$ 198 r 37 $74\overline{)8,491}$ 113 r 9 $58\overline{)11,497}$ 208 r 17 $84\overline{)9,653}$ 114 r 77 $93\overline{)9,917}$ 107 r 26

Money math

Understanding money

5¢ = 5 pennies 28¢ = 28 pennies

$1 = 100 pennies 2 dimes = 4 nickels

50¢ = 5 dimes $1 = 4 quarters

Manipulating dollar and cent signs

$12¢ - 2¢ = 10¢$ $32¢ + 51¢ = 83¢$ $45¢ + 12¢ = 57¢$ $72¢ + 19¢ = 91¢$ $59¢ + 38¢ = 97¢$ $96¢ - 75¢ = 21¢$ $86¢ - 29¢ = 57¢$ $97¢ - 18¢ = 79¢$

$\$1.23 + \$.11 = \$1.34$ $\$5.13 + \$1.65 = \$6.78$ $\$12.13 + \$3.89 = \$16.02$ $\$155.67 + \$168.32 = \$323.99$ $\$6.49 - \$.32 = \$6.17$ $\$8.79 - \$3.59 = \$5.20$ $\$10.05 - \$5.89 = \$4.16$ $\$123.02 - \$57.54 = \$65.48$

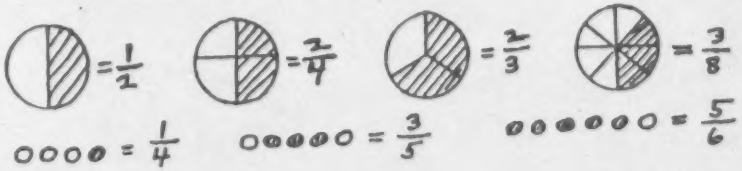
$\$1.76 \times 3 = \$5.28$ $\$13.92 \times 5 = \$69.60$ $\$3.69 \times 27 = \$99.63$ $\$41.76 \times 35 = \$1461.60$

$4\overline{)\$7.68}$ $\$1.92$ $25\overline{)\$100.25}$ $\$4.05$

$39\overline{)\$15.99}$ $.41$ $89\overline{)\$46.28}$ $.52$

Fractions

Concepts—Name the colored-in parts with a fraction



Manipulating fractional numbers

$\frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$ $\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$ $\frac{5}{12} + \frac{2}{12} = \frac{7}{12}$

$1\frac{1}{3} + 2\frac{1}{3} = 3\frac{2}{3}$ $6\frac{5}{11} + 1\frac{2}{11} = 7\frac{7}{11}$ $3\frac{1}{9} + 4\frac{4}{9} = 7\frac{5}{9}$ $1\frac{1}{9} - \frac{1}{9} = 1$ $7\frac{5}{6} - 2\frac{4}{6} = 5\frac{1}{6}$ $8\frac{6}{7} - 5\frac{3}{7} = 3\frac{3}{7}$

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$\frac{7}{8}$ $\frac{4}{9}$ $\frac{5}{7}$ $\quad \frac{4}{5} \times \frac{1}{2} = \frac{4}{10} = \frac{2}{5}$ $\quad \frac{3}{4} \times \frac{2}{3} = \frac{6}{12} = \frac{1}{2}$

$\frac{2}{8}$ $-\frac{4}{9}$ $-\frac{1}{7}$ $\quad \frac{3}{6} \div \frac{1}{3} = \frac{9}{6} = 1\frac{3}{6}$ $\quad \frac{1}{2} \div \frac{3}{4} = \frac{4}{6} = \frac{2}{3}$

$\frac{5}{8}$ $\frac{2}{9}$ $\frac{4}{7}$

$\frac{1}{2} = \frac{5}{10}$ $\quad \frac{3}{4} = \frac{9}{12}$ $\quad \frac{2}{3} = \frac{4}{6}$ $\quad \frac{3}{5} = \frac{6}{10}$

$\frac{1}{4}$ $\quad 2\frac{5}{6}$ $\quad \frac{7}{8}$ $\quad 3\frac{6}{10}$ $\quad 1\frac{3}{10}$ $\quad 7\frac{1}{6}$ $\quad 10\frac{1}{10}$ $\quad 9\frac{4}{8}$

$+\frac{1}{2}$ $\quad +5\frac{2}{12}$ $\quad -\frac{1}{4}$ $\quad -1\frac{2}{5}$ $\quad +\frac{1}{5}$ $\quad +5\frac{2}{3}$ $\quad -3\frac{5}{10}$ $\quad -4\frac{5}{8}$

$\frac{3}{4}$ $\quad 7\frac{12}{12} = 8$ $\quad \frac{5}{8}$ $\quad 2\frac{3}{10} = 2\frac{1}{5}$ $\quad 1\frac{5}{10} = 1\frac{1}{2}$ $\quad 12\frac{5}{6}$ $\quad 6\frac{5}{10} = 6\frac{1}{2}$ $\quad 4\frac{7}{8}$

Fractions expressed as decimals

.2 $\quad$ .6 $\quad$ .18 $\quad$ 7.86 $\quad$ .5 $\quad$ .17 $\quad$ 1.32 $\quad$ 8.22

+.1 $\quad$ +.7 $\quad$ +.90 $\quad$ +3.12 $\quad$ -.2 $\quad$ -.08 $\quad$ -.42 $\quad$ -4.55

.3 $\quad$ 1.3 $\quad$ 1.08 $\quad$ 10.98 $\quad$ .3 $\quad$ .09 $\quad$ .90 $\quad$ 3.67

.4 $\quad$ .5 $\quad$ .15 $\quad$ 5.86 $\quad$ 2.4 $\quad$ .32 $\quad$ 2.16 $\quad$ 5.1

x.2 $\quad$ x.6 $\quad$ x.3 $\quad$ x.2 $\quad$ $2\overline{)4.8}$ $\quad$ $3\overline{).96}$ $\quad$ $.6\overline{)1.296}$ $\quad$ $.11\overline{)561}$

.08 $\quad$ .30 $\quad$ .045 $\quad$ 1.172

Word problems

1. If a boy has 2 red balls and 3 green balls, what is the total number of balls? 5
2. A girl had 27 dolls and then gave 9 away. How many dolls does she have left? 18
3. If 4 candy bars cost $1.00, then what is the price for each? 25¢
4. Each cookie cost 17¢. How much does 23 cookies cost? $3.91
5. Joe gave Mark 1/4 of a pie and gave Sue 1/2 of a pie. How much of the pie did Joe give away in all? 3/4
6. Ed bought $17.34 worth of toys on sale which regularly cost $34.11. What is the difference between the sale price and the regular price? $16.77

7. Ed bought a $6.53 ball, a $.99 hammer, a $13.76 saw, and 6 nails which cost $.04 apiece. What is the total price for the things Ed bought? $21.52.
   How much would 10 nails cost? 40¢
8. Mike ran 3 miles a day for 5 days and Sue ran 2 miles a day for 6 days. What is the combined number of miles that both Mike and Sue ran? 27 miles
   Who ran the most miles? Mike
9. Jim drove 120 miles in 5 days and Ann drove 176 miles in 4 days. Who drove the most miles each day? Ann
   What is the total number of miles driven each day? 24 + 44 = 68 miles
10. Gary wanted to take Debbie out to dinner. He had $14.27 on Monday and would get $16.54 more on Wednesday. Each single dinner cost $15.17. Could Gary buy dinner for both himself and Debbie on Tuesday? No
    Could he pay for both dinners on Thursday? Yes

Source: Hadley, G. D. The three R's. Washington, D.C.: Acropolis Books, L.T.D., 1977.

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APPENDIX IX (cont.)

Arithmetic Evaluation Sheet

Child's name _____

Date _____

	Good	Aver.	Poor
Identifying numbers and their values			
1. Has memorized the counting numbers	___	___	___
2. Knows each counting number's value	___	___	___
3. Knows the place value of numbers	___	___	___
Addition			
1. Knows basic facts	___	___	___
2. Adds from right to left and vertically	___	___	___
3. Carries correctly	___	___	___
Subtraction			
1. Knows basic facts	___	___	___
2. Subtracts from right to left and vertically	___	___	___
3. Borrows correctly	___	___	___
Multiplication			
1. Knows basic facts	___	___	___
2. Multiplies from right to left and times top numbers	___	___	___
3. Carries correctly	___	___	___
4. Can multiply with more than one multiple	___	___	___
Division			
1. Knows basic facts	___	___	___
2. Divides with the divisor from left to right	___	___	___
3. Subtracts and brings down the next number	___	___	___
4. Can divide with more than one divisor	___	___	___
Money math			
1. Recognizes and understands the value of money	___	___	___
2. Manipulates the money symbols correctly	___	___	___
Fractions			
1. Understands the concept of fractions	___	___	___
2. Can add fractions	___	___	___
3. Can subtract fractions	___	___	___
4. Can make equivalent fractions	___	___	___
5. Can work with mixed fractions	___	___	___
6. Can multiply fractions	___	___	___
7. Can divide fractions	___	___	___
8. Can borrow in mixed fractions	___	___	___
9. Can work with fractions expressed as decimals	___	___	___
Word problems			
1. Reads and understands the problem	___	___	___
2. Can separate and organize the data	___	___	___
3. Accurately performs the necessary operations	___	___	___

Source: Hadley, G.D. The three R's. Washington, D. C.: Acropolis Books, L.T.D., 1977.

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TABLE 11.1
SUMMARY OF CATEGORIES FOR
STUDENT WORK PROCEDURES AND ANSWER PATTERNS

1. Correct answer from a standard procedure
2. Correct answer from a nonstandard procedure
3. No response
4. Random errors
5. Errors related to conceptual learning
   A. Meaning and properties of an operation
   B. Structure of the numeration system
   C. Renaming and regrouping
6. Errors related to sequencing steps within procedures
   A. Incorrect order of the steps in a procedure
   B. Incomplete procedures
7. Errors related to selecting information or procedures
   A. Correct algorithm for the operation, but some basic facts for a different operation
   B. Algorithm and basic facts for a different operation
   C. Correct facts for the operation, but an algorithm for a different operation
   D. Algorithm for a different type of exercise for the same operation
8. Errors related to recording work
   A. Incorrect numeral formation
   B. Digit transposition
   C. Misalignment of digits

Source: Blackman, C.A. Analyzing children's work procedures. In M.N. Suydam & R.E. Rays (Eds.) Developing Computational Skills. Reston, Virginia: National Council of Teachers of Mathematics, 1978 yearbook.

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Types of Individualized Instruction

DIMENSIONS VARIED

Type A	*Type B*	*Type C*
1. Concept	1. Concept	1. Developmental level
2. Time schedule	2. Time schedule	
3. Developmental level		

INSTRUCTIONAL ADVANTAGES

Type A	*Type B*	*Type C*
1. Every child works at own speed	1. Fewer activities to prepare than with Type A	1. Fewer activities to prepare than with Types A and B
2. Every child begins where he left off	2. Fewer groups and broader objectives facilitate student assessment	2. Student-and-teacher interaction encouraged
3. Effective for lower cognitive learning (i.e., multiplication tables and algorithms)	3. Fewer classroom-management problems	3. Less negative connotation associated with ability grouping
	4. Some student interaction encouraged	4. Many individual learning needs met
		5. Classroom management simplified
		6. Transition from traditional classroom procedures facilitated

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INSTRUCTIONAL DISADVANTAGES

Type A	*Type B*	*Type C*
1. Requires extensive teacher time for preparing appropriate learning experiences	1. May not meet individual student needs since all students do all activities	1. Curriculum not completely tailored to individual needs
2. Student assessment is time consuming and often inaccurate	2. Initially, students have difficulty participating in activities not directly supervised by the teacher	2. Three activities must be designed for each concept instructed
3. Classroom-management problems recur	3. Activity instruction must be simple and complete, making process-type activities difficult to implement	
4. Ineffective for process or conceptual learning (i.e., problem solving, analysis, generalization, or classification)	4. Additional preparation required, while advantages gained over traditional large-group instruction are only minimal	
5. Teacher-and-student interaction reduced		
6. Behavioral-objective curriculum soon becomes the knowledge ceiling instead of the minimum standard		

EXAMPLES

Type A	*Type B*	*Type C*
1. Diagnostic/prescriptive teaching	1. Many "open space" curricula	1. Developmental activity sequences
2. Behavioral-objective inventories	2. Departmental instruction	
3. Programmed texts		
4. Computer-aided instruction		

Source: Souviney, R.J., Keyser, T. & Sarver, A. Mathmatters, Santa Monica, California: Goodyear Publishing Company, 1978.

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Fig. 1

Level 1:
Examples and *nonexamples* of the concept

Children understand a concept to the extent they can make the following moves:	Some sample questions to assess understanding of the concept *prime number*
1. *Give or identify examples of the concept*	1. Which of the following numbers are prime? 7, 9, 2, 17, 21 Can you find two prime numbers greater than 20 but less than 30?
2. *Defend choices of examples of the concept*	2. Why did you choose 17 as a prime number? Two is a prime number? I don't see how. Why do you think so?
3. *Give or identify nonexamples of the concept*	3. Two of these numbers are not prime can you find them? 1, 2, 3, 4, 5
4. *Defend choices of nonexamples of the concept*	4. You say 1 and 4 are not prime numbers. What are your reasons?

Level 2:
Characteristics of the concept

5. *Identify things that are necessarily true about examples of the concept*	5. Suppose I tell you that 97 is prime. What can you say for sure about 97? I have written a number on the back of this card. I promise it is a prime number. Can you tell me five things that are true about it?
6. *Determine properties sufficient to make something an example of the concept*	6. How can you tell for sure a number is prime? If a number is odd does it have to be prime? Why?
7. *Tell how one concept is like (or unlike) another concept*	7. What is true about both prime numbers and composite numbers? How are prime numbers different from composite numbers?
8. *Define the concept*	8. Who can tell me exactly what prime numbers are?
9. *Tell how we use the concept*	9. What can we do with prime numbers—how can they help us?

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Fig. 2

Level 1:
Understanding *what* the generalization says

Children understand a generalization to the extent they can make the following moves:	Some sample questions to assess understanding of the generalization, the sum of two odd numbers is an even number.
1. *Show understanding of the concepts in the generalization*	1. See concept moves and questions for *even, odd,* and *sum*
2. *State the generalization in their own words (paraphrase it)*	2. Can you say this in your own words? I don't understand it as it is written in the book.
3. *Create or recognize instances of the generalization*	3. Can you show me two odd numbers whose sum is an even number?
4. *Tell when the generalization can be used or state conditions under which it is true*	4. When can you be sure the sum of two numbers will be an even number?
5. *Apply the generalization in exercises and simple problems*	5. One of these sentences can't be true. Can you find it without doing any adding? 73 + 67 = 140 37 + 121 = 158 47 + 97 = 144 73 + 125 = 195

Level 2:
Understanding *why* the generalization is true

6. *Give a plausible argument or proof why the generalization is true*	6. An odd number is one more than an even number. How can this help us to convince someone that two odd numbers add to make an even number?
7. *Use physical or numerical examples to illustrate the rule.*	7. Can you show me this generalization using only red Cuisenaire rods and white Cuisenaire rods? Remember, a train of all red rods will always be an even number.
8. *Recognize the applicability of the generalization in unfamiliar contexts*	8. There are 25 children in this room and everyone in line out in the hall except one child has a partner. If we all join the line outside could everyone have a partner?

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Fig. 3

Level 1:
Understanding *how* the procedure works

Children understand a procedure to the extent they can make the following moves:	Some sample questions to assess u derstanding of the procedure for addi fractions
1. *Accura.ely carry out the procedure*	1. Can you add ⅗ and ¾ for me?
2. *Show another student how to do the procedure*	2. Terry, you were here yesterday, w you show Al how to add these fra tions?
3. *Paraphrase the procedure step by step*	3. Before you pick up your pencil, c you tell me everything you are goi to do to add 5/3 and 4/5?
4. *Tell when they can use the procedure*	4. On which of these problems do y need to find a common denominato $\frac{2}{3}+\frac{4}{9}$ $\frac{3}{4}+\frac{7}{4}$
5. *Execute the procedure rapidly and accurately*	5. Can you work these two additions only one minute?
6. *Understand prerequisite knowledge*	6. See concept moves for: numerato denominator, common denominato fraction, adding, and equivalent fra tion. The child would also need to unde stand the procedure for adding co mon fractions with the same denom nator.
7. *Find errors in work*	7. I made a mistake in my work. Can y find it?

Level 2:
Understanding *why* the procedure works

8. *Show answers obtained as a result of the procedure are reasonable*	8. You have an answer of 11/12 for 2 + 1/4. Can you use these Cuisen rods or the geoboard to show that 2 + 1/4 = 11/12 is true?
9. *Give a plausible argument or proof justifying the procedure*	9. Let's go over your work step by ste Can you convince me what is r happening in each step? Why do y find a common denominator?
10. *Recognize the applicability of the procedure in new contexts*	10. Can you now add 3 2/3 and 5 1/4

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Fig. 4

Level 1:
Understanding *what* the fact says

Children understand a number fact to the extent they can make the following moves:	Some sample questions to assess understanding of the fact 5 + 4 = 9
1. *Recall the fact*	1. 5 + 4 = ?
2. *Create or recognize embodiments of the fact*	2. Can you use the number line, the rods, the counters, and your fingers to show 5 + 4 = 9?
3. *Understand the concepts in the fact*	3. See understanding moves for 5, 4, 9, +, =.
4. *Use the fact in simple exercises*	4. $\begin{array}{r} 5 \\ 4 \\ +1 \\ \hline ? \end{array}$
5. *Apply the fact*	5. Make up a story problem that asks you to use 5 + 4 = 9.

Level 2:
Understands *why* the fact is true and realizes its significance

6. *Show the truth of the fact using objects, models, or other facts*	6. Suppose I say the 5 + 4 = 10. Can you show me I am wrong? Starting with 4 + 4 = 8, can you show me that 5 + 4 = 9?
7. *Complete related statements of the fact*	7. Does 5 + 4 = 4 + 5? What makes 5 + □ = 9 true?

Source: Davis, E. J. A model for understanding understanding in mathematics. Arithmetic Teacher. 1978, 26, 13-17.

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Spelling

Spelling

Introduction

This writer's brief perusal of spelling literature revealed some interesting facts. Almost every article, that provided a historical review of spelling literature, (See references), emphasized the gap that exists between research and actual teaching practice in spelling. Although spelling is one of the more thoroughly researched areas of the curriculum, the research has dealt more with classroom instruction, and the research is not being applied.

Fitzsimmons and Loomer (1974, 1977) sent a questionnaire to 1,472 classroom teachers in Iowa, asking whether they agreed or disagreed with research supported practices or other popular practices in the teaching of spelling, and whether they utilized the research practices or other popular practices in the teaching of spelling. The questionnaires were returned by 1,289 teachers; very few teachers agreed with or utilized research supported methods. Fitzsimmons and Loomer (1974, 1977) believe a major reason for the disparity between research and practice is that the information is not available to teachers in sources they commonly use such as spelling series and/or programs.

If the current spelling series and/or programs are not based on research, what are they based on ? Teaching appears to be influenced more by habit than research (Allred, 1977; Fitzsimmons & Loomer, 1974, 1977; Loomer, 1978; Loomer & Strege, 1983; Petty, 1980; Stanback, 1980).

Stanback's (1980) historical review of spelling from colonial times to the 1970s makes it all too clear that controversy abounds in the teaching of spelling. One of the major controversies has centered around whether English orthography is sufficiently regular to design programs on that basis or whether it is so irregular that each spelling word must be learned individually via rote memory. The teaching of spelling through the 1950s reflected the viewpoint that spelling is a direct learning task whereas spelling instruction in the 1960s and 1970s reflects more recent findings indicating that the English sound - symbol correspondence rules are much more consistent than previously thought. The majority of available spelling programs reflect the linguistic findings in spite of Horn's (1969) warning that evidence of the effectiveness of the linguistic approach in the classroom was needed. Thus, spelling like almost every other area is influenced by the "popular press."

Although there are many different definitions of spelling, Graham and Miller's (1979) definition appears to take into account all aspects of spelling. They state that it is the ability to recognize, recall, reproduce, or obtain orally or in writing the correct sequence of letters in a word. Hammill (1978) states that spelling is the forming of words from letters in both written and oral forms according to accepted usage.

The acquisition and practice of spelling skills in children and adults have received considerably less attention in the literature than reading

skills (Nelson, 1980, p. 490). Why does it matter whether students learn to spell? Incorrect spelling and/or illegibility of writing can distort or change the meaning of a sentence; thus accurate spelling is necessary for optimal written communication. What causes problems or disabilities in spelling? Stanback (1980) states that spelling knowledge is a mix of helpful information about the relation of the spelling and pronunciation patterns of the word and rote knowledge specific to the word. She believes that students with a spelling disability are handicapped in the ability to take advantage of the helpful information and that the burden on rote memory becomes excessive.

There are many sources of difficulty in spelling and the diagnostician will have to sort through these sources in order to assist individual students, but before the sorting process begins, knowledge of the subject matter of spelling is needed. Then, an attempt must be made to obtain more specific information regarding the needs and abilities of the student. One way to acquire knowledge regarding subject matter is to investigate what it is a student does when learning to spell.

Models for Spelling

One of the more frequently cited models is by Personke and Yee (1966). A reprint of the model is presented in Appendix I. It is an information processing system which has five phases: (a) initial input processing; (b) processing information before deciding what to do; (c) decision-making; (d) execution of selected behavior; and (e) feedback of information through self-evaluation or from other persons. The model begins with the assumption that a student has a need to spell a word and once he/she needs to spell the word the processes begins. The five major processes of the model are: (a) memory channel - the student only uses internal input; (b) memory - kinesthetic detour - the student writes a word automatically; (c) checking channel - student uses external sources first; (d) proofreading channel - student writes the word, scans it and if in doubt seeks external output; and (e) proofreading - rewrite detour - student refers to an external source, learns response is incorrect, and rewrites. The channels are thought to be complimentary and one more appropriate than others in certain situations. Westerman (1971) has attempted to point out the major strengths and weaknesses of each channel (See Appendix II). This model may help the classroom teacher or diagnostician know in what channel a breakdown occurred, but will not be sufficient to tell them how to proceed with assessment and intervention. Westerman (1971) presents a comprehensive task analysis model of spelling which shows the hierarchy of spelling from the base of basic language concepts to written spelling. Again, the diagnostician could attempt to determine where a breakdown occurred but will need more information. The models serve as reminders that numerous skills and abilities must be integrated before efficient spelling ability is obtained. What those skills and abilities are will be somewhat dependent on the instructional approach used with the student and the theoretical or philosophical base for the approach.

Before the 1960s, spelling was generally taught as a serial learning task which consisted of memorizing many words and emphasized visual processing. However, the work of Hanna and his associates at Stanford

(Hanna & Hanna, 1959; Hanna & Hanna, 1965a, 1965b, Hodges & Rudorf, 1965; Rudorf, 1966) indicated that rules of phonology and morphology were much more consistent than previously thought and new models for spelling were developed. Developmental studies provide evidence that children can spell nonsense words they have never seen before and that they have learned rules they have never been taught (Beers, 1980; Beers & Henderson, 1977; & Read, 1973). The results of these studies appear to show that the children's knowledge of written words is acquired systematically and developmentally, and that the acquisition process is too complex to be limited to serial learning or memorization. APPENDIX IV contains an example of a developmental pattern.

Thus, there is evidence that children do acquire certain rules for spelling without direct instruction. What there is no clear cut evidence for to date, is that teaching spelling via rules is the most effective way to teach spelling. The task of the diagnostician remains the same no matter what model of spelling is being used in the classroom. That task is to find out what specific strengths and weaknesses the student has and help the student develop strategies for learning to spell based on this knowledge.

Factors Influencing Spelling Skills

Howell and Kaplan (1980) simplified the prerequisites for spelling into the ability to disciminate accurately what one hears (a linguistic approach). Wallace and Larsen (1978) report the following as some of the prerequisite skills for spelling: (a) adequate hearing and vision; (b) fine motor skills developed enough to manipulate paper and pencil; (c) acceptable pronunciation of letters/words; (d) recognition of and ability to name the letters; (e) knowledge of the meaning of a word; and (f) desire to successfully communicate in written form. Cicci (1980) recommends that the following questions be asked in order to find out the source of the student's difficulties in spelling:

1. Can the student read the words he/she is expected to spell?
2. How is spelling tested?
3. How is the student graded for spelling?
4. Is there a difference in oral and written spelling?
5. Is there a difference in the student's spelling of words that follows a close grapheme, phoeneme correspondence and those that must be retained more by visual memory?

Hammill (1978) believes that initially it should be determined if the student has sufficient mental ability for the spelling tasks and normal hearing, speech, and vision.

Hunt, Hodrell, and Hannum (1963) describe four abilities related to spelling skills: (a) the ability to spell words that are phonetic;

(b) the ability to spell words that involve roots and affixes and knowledge of rules for combining them; (c) ability to look at a word, note its structure and reproduce it; and (d) ability to spell the "demons." Loomer and Strege (1983) believe that spelling difficulties may be due to: (a) a lack of interest; (b) poor proofreading skills; (c) little writing ability; (d) no direction concerning what words need additional study; (e) no method of attack; and (f) improper use of self-correction. They believe that the attitude toward spelling is dependent to some degree on the teacher's attitude and the place of spelling in the curriculum.

Two comprehensive lists of frequent causes of spelling deficiency, that are over 20-years-old, are worth reviewing. Fitzgerald (1951) refers to a list first organized by Hollingsworth:

1. sensory defects either of the eye or of the ear
2. the quality of general intelligence
3. faulty auditory perception
4. faulty visual perception
5. sheer failure to remember
6. lack of knowledge of meaning
7. motor awkwardness and uncoordination (p. 193).

Horn's (1960) list includes the following:

1. poor study habits
2. lack of sufficient reading
3. writing slowly or illegibly
4. faulty speech habits
5. lack of interest (no other factors impede learning in spelling as much as does a lack of interest or the presence of undesirable attitudes)
6. home conditions
7. physical characteristics
8. personality traits
9. specialized disabilities
10. lack of good sound perception and discrimination
11. low intelligence even though high intelligence does not guarantee superior spelling ability
12. poor visual memory (pp. 1347 - 1349).

Read, Allred, and Baird (1972) suggest that certain readiness criteria be met before students are required to participate in formal spelling instruction. Thus, the diagnostician might want to check whether a student can do the following:

1. Have the ability to write and name all the letter of the alphabet correctly.
2. Be able to copy words correctly.
3. Be able to write his or her own name without copying.
4. Be reading at about a second-grade reading level or better.
5. Be able to enunciate words clearly.
6. See that words are composed of different letters.
7. Have a beginning phonetic sense and recognize the common letter-sound combinations.
8. Be able to write a few simple words from memory.
9. Ask for words he or she is in doubt about and be able to express a few thoughts in writing.
10. Demonstrate a desire and interest in learning to spell (p. 14).

From a linguistic point of view, the following skills are believed to be necessary for proficiency in spelling;

1. discriminate between the phonemes of the language;
2. identify graphemic options of each of the sounds;
3. identify syllables in oral speech and reproduce them in writing;
4. recognize stress when present;
5. relate phonemes to their immediate environment;
6. recognize morphemes such as roots, affixes and inflections;
7. utilize certain principles of morphophonemics (how word parts are joined and how morphemes change in combination to form words);
8. to relate meaning (as determined by syntax) to spelling (Rudorf, 1966, p. 54).

Henderson (1980) believes that errors in spelling are either "(1) predictable and indicative of a particular stage of development or (2) deviant and indicative of some incapacity or misconstruction" (p. 138).

What is clear from the brief review of factors influencing spelling skills is that a variety of skills/attributes are viewed as necessary for proficient spelling. It appears that the more skills the students have mastered, the more efficient they will become. It is important to explore more systematically those factors which have been proven necessary for spelling proficiency and it is discouraging to find out that so few factors have been identified as necessary via research findings.

Specific Spelling Disabilities

Yes, there are students with significant spelling disabilities (Deno, et al., 1980) but no, there is not a magic list of characteristics that will pinpoint these students. Stanback (1980) reviews various types of spelling disabilities. There are adults with acquired dyslexia who have spelling difficulties. The adults who obtain a verbal-performance split on the Wechsler scales in favor of the performance IQ generally make more phonetically inaccurate errors while those with a higher verbal than performance IQ make more order errors or add extraneous letters. Some researchers such as Johnson and Myklebust (1967) and Bannatyne (1968, 1969) have advocated an ability-training model for diagnosing and remediating spelling difficulties. Weaknesses in certain processes such as auditory or visual sequencing are thought to be the cause of the disability. Boder's (1970, 1971, 1973) approach is also an ability-training or process model. She has classified poor spellers as belonging to one of three groups. The dysphonetic student is unable to decipher unknown words because of problems with auditory perception/discrimination while the dyseidectic student has difficulties with visual perception. The students in the mixed group have problems in both processes. Stanback (1980) believes that Boder is incorrect in assuming there are three distinct groups because when the Boder data were reanalyzed, 85% of the students seemed to have problems with phonetics.

There is research indicating that a poor reader is usually a poor speller but that the good reader is not necessarily a good speller (Cicci, 1980). Nelson (1980) believes that reading is easier to learn than spelling and Stanback (1980) reports that a "true" spelling disability may be more difficult to remediate than a reading disability.

Nelson (1980) analyzed the spelling errors of 30 children who had been diagnosed as having developmental dyslexia and 30 children chosen to match the dyslexic children in spelling achievement. The 30 control children were "average" spellers thus they were younger than the dyslexic children. The W.E.S.T. was administered to the children and the first 20 spelling errors made by each child were scored qualitatively. The frequency of order errors and orthographically illegal spellings was low in both groups. Both groups made more phonetically inaccurate mis-spellings than either of the other two types of errors. The results indicated that the quality of the dyslexic children's spelling was essentially normal in contrast with the theories that postulate children's specific spelling disabilities are due to primary sequencing, auditory linguistic or visual linguistic problems. Nelson's (1980) hypothesis regarding the causes of spelling retardation center on children with both reading and spelling problems and those with

only spelling problems. He does not believe that serious spelling disabilities can be accounted for solely as a secondary effect of a reading disability. He believes that children with both reading and spelling problems have a learning problem rather than a retrieval problem while the children with spelling problems only has a specific retrieval problem rather than a learning problem. The phonemic analysis aspect of spelling seems to be acquired at a normal level and memory is deficient in the children with spelling problems only. Stanback (1980) concludes that spelling disabilities may vary, largely on the dimension of severity of problems rather than in qualitatively distinct types of disability.

Diagnostic Process

The first step in the diagnostic process for any area is the determination of needs. If screening of the referral information indicates some concerns regarding spelling ability, the diagnostician/school psychologist should attempt to find out what is already known concerning the student and his/her spelling skills. Hammill (1978) suggests that the following questions need to be asked when a student fails in spelling:

1. Does the child have sufficient mental ability to learn to spell?
2. Are his hearing, speech, and vision adequate?
3. What is his general level of spelling ability?
4. Has he areas of specific weakness in spelling?
5. What systems, techniques, or activities might be used to remediate his difficulties (p. 150)?

This author suggests that instead of asking question #5 during the referral analysis stage, the psychologist needs to know what approach, techniques, etc., have already been used with the student. If the analysis of this information warrants further assessment in order to pinpoint the spelling problems and plan remediation, then decisions must be made as to what techniques will be used to collect data and who will collect the data. The most effective diagnostic process will be one where the psychologist, classroom teacher, and anyone else involved in the student's spelling experiences, work together to determine and conduct appropriate assessment.

Formal Assessment

If there is no known information regarding the student's overall spelling performance, such as the results of recent standardized tests, it may be of value to gather that information as long as one remembers that only very general information will be obtained. If the instrument assesses spelling as a proofreading task rather than a dictated word task then it is not really assessing skills comparable to those skills required in the classroom. If a survey instrument is administered by the

psychologist, observation will be part of the assessment process and an error pattern analysis should be attempted. Such an analysis should also be attempted even if someone else administered the instrument as long as the words tested and the student's responses are available.

The psychologist and the rest of the diagnostic team must, as always, be vigilant when choosing an instrument. They must know exactly what the test does (what does the test measure, for whom?). Whether it is technically adequate, etc. They must be prepared to use informal techniques with formal techniques and supplement the formal instruments with additional assessment techniques.

A complete description of all available spelling tests through the 1950s is found in Horn (1960). Evaluations of some of the current survey tests of achievement, which include a measure of spelling skills, and of the diagnostic spelling tests can be found in Buros (1978), Hammill (1978), Howell and Kaplan (1980), Salvia and Ysseldyke (1981), Wallace and Larsen (1978), and Westerman (1971). Tables 1 and 2 contain cursory information regarding some of the "Popular" survey and diagnostic tests.

It is appparent from these tables that both the survey and the "diagnostic" tests may only provide general information regarding students' specific strengths and weaknesses in spelling. It appears that the W.E.S.T. and T.W.S. are worth exploring further. A manual for the W.E.S.T. can be obtained from Nelson (1980).

Informal Assessment

During the diagnostic process the following steps should be taken: identify the relevant skills a student has or has not mastered; pinpoint the pattern of errors; provide guidelines for remedial instruction; and evaluate progress. Informal assessment becomes an integral part of such a process, and often more than one type of informal assessment technique is used to gather information. The technique to be briefly discussed in this paper are informal tests/inventories, observation error pattern analysis and task analysis. Other techniques that are discussed under Instruction/Remediation could also be used as assessment techniques.

Diagnostic Tests/Inventories

There are informal inventories that have been developed by others (Betts, 1956; Kottmeyer, 1959; Mann & Suiter, 1974) that can be obtained for use by psychologists. These inventories are made up of lists of words that have been grouped by grade level. Achievement scores can be obtained based on the level at which a student spells appropriately 90-100% of the words. This level is considered the achievement level. Wallace and Larsen (1978) succinctly point out the short comings of these measures. There are no standardization data; it is assumed that the word lists do adequately sample the words taught at that grade level. Since two of the lists were developed in the 1950s and there have been major changes in spelling programs/series, it is doubtful that the lists would be appropriate. Mann and Suiter (1974) did not specify the sources for their word lists.

*Table 1

Standardized Survey Test that Measure
Spelling Achievement

Instrument	Grade/age level	**Norms	Reliability	Validity	Skills Measured	Evaluators Comments
Brigance Diagnostic Inventories-Spelling	Developmental level less than 7 years through secondary school age.	CR	None	Content	Initial consonants, initial clusters, suffixes, prefixes, and calendar words.	Good for planning and evaluating. Content validity-good. Reliability data should be obtained.
California Achievement Test (CAT) Spelling	1-12	NR & CR	Internal consistency test-retest on CR use	Content cross-validation	Proofreading words in sentences.	Adequately standardized reliability and validity evidence good.
Iowa Test of Basic Skills	1.7 -	Yes	Internal consistency.	Content criteria validity based on earlier forms of the test	Multiple choice proofreading	Development and standardization adequate need. Test-retest reliability.
Metropolitan Achievement Test (MAT) Spelling	2-9	NR & CR	Internal consistency	Content criterion related	(2-4 dictated words) (4-9 proofreading)	There are 2 sets of tests: Survey and Instructional materials contain detailed content outlines. Objectives for each item, guidelines

Instrument	Grade/age level	**Norms	Reliability	Validity	Skills Measured	Evaluators Comments
						for interpretation. Technically adequate. Can use the Instructional Battery for planning and evaluation.
Peabody Individual Achievement Test (PIAT) Spelling	K-12	Yes	Test re-test	Content concurrent	Multiple choice proofreading	Reliabilities of subtests too low for making decisions - only content validity really evident screening only
Stanford Achievement Test (SAT) Spelling	1.5-9.5	Yes	Split-half estimates kr-20 coefficients	Content criterion	1.5-2.4 optional test of 30 dictated words. 2.5-3.4 proofreading words - correct or incorrect 3.5-9.5 multiple choice proofreading.	Standardization, reliability, and validity exceptionally good. Provides instructional objectives and suggestions for teaching the objectives.
Wide-Range Achievement Test (WRAT) Spelling	Preschool-adult	Yes, but not a national sampling.	None reported for 1978 revision.	No appropriate data except developmental.	Copying marks, writing ones name, dictated words.	Limited behavior sampling, inadequate standardization absence of reliability and validity data in 1978 revision can do an error analysis of responses.

Instrument	Grade/age level	**Norms	Reliability	Validity	Skills Measured	Evaluators Comments
Woodcock-Johnson Psycho-educational Battery - Dictation and proofing sub-tests.	3-80 Years	Yes	Split-half	Criterion	Dictated words. Proofreading type written passages.	Adequately standardized data supports reliability and validity information. May have limited instructional relevance.

*This table was prepared from material by Howell and Kaplan, 1980; Salvia and Ysseldkye, 1981, and Wallace and Larsen, 1978; as well as from this author's experience with the instruments.

**NR=Norm referenced CR=Criterion referenced

*Table 2

Diagnostic Spelling Tests

Instrument	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Comments
Gates-Russell Spelling Diagnosis Test	?	No	None reported	None reported	Spelling words orally, word pronunciation, giving letters for letter sounds, spelling one and two syllables reversal, word attack, auditory discrimination and effectiveness of visual auditory, kinesthetic, or combined methods of study.	Attempts to measure some of the factors underlying spelling ability; available research does not support use of some of the subtests. Can be used in initial step of diagnostic process.
Lincoln Diagnostic Spelling Test	Grades 5-8 Grades 9-10	Yes, percentile ranks small samples size for standardization.			Pronunciation, enunciation, use of rules.	The test has 2 forms for each level. Breaks down errors into 10 categories should only be used as a general measure of spelling performance.

Instrument	Grade/age level	**Norms	Reliability	Validity	Skills Measured	Evaluators Comments
Phonovisual Diagnostic Spelling Test	Grades 3+				Tests for all consonant sounds and 17 fundamental vowel sounds.	Assesses part of spelling. Is structured to discover weaknesses in sound-symbol integration skills.
Spellmaster	K-adult	No	None reported	None reported	Three categories of words included: regular words, irregular words, and homonyms.	Comprehensive scope and sequence chart included. Can be used for programming remedial instruction.
Test of Written Spelling (TWS)	Ages 6-13	Yes	Internal consistency	Content concurrent	Dictated word list Predictable words - unpredictable words	Words from 10 commonly used spelling series. Designed to provide only a general estimate of spelling ability but appears technically adequate for that. Based on theory that spelling has a linguistic base.

Instrument	Grade/age level	**Norms	Reliability	Validity	Skills Measured	Evaluators Comments
W.E.S.T.	Ages 5½-12	Yes		Concurrent	160 dictated words (20 at each age level). Words thought to be particularly susceptible to order errors included.	The first 20 incorrectly spelled words are analyzed for errors. The errors are categorized as: order errors/ phonetically inaccurate errors, and orthographically illegal errors can determine if the errors the students make are typical or atypical. This author did not have access to this manual but it looks like it should be from the author.

*This table was prepared from material by Hammill, 1978; Nelson, 1980; Salvia & Ysseldkye, 1981; Wallace & Larsen, 1978; and Westerman, 1971.

Thus, rather than use these instruments which have questionable validity, it would be more appropriate to devise an informal spelling inventory that is based on the program/series being used in the schools assigned to the psychologist. The purpose of the informal test/inventory may be to identify the student's general spelling level as well as to determine specific patterns of errors. Emphasis is placed on looking at intra-individual differences. Mann and Suiter (1974) provide the following directions for developing an informal spelling inventory (ISI):

1. Select a sample of words from each basal spelling book of a given spelling series (15 words from grade 1 and approximately 20 words from grades 2-8).

2. Begin at the first level for all students below grade 5. Begin with the third level of words for students in grades 5 and above.

3. Use dictated-word format. Say the word, use it in a sentence, repeat the word.

4. Continue testing until a student has six consecutive errors.

5. Achievement level is the highest level at which 90-100% of the words are correct. The teaching level is where 75-89% of the words are correct.

6. Analyze the errors.

There is an example of an ISI, developed from a basal series, in Appendix V. Deno, Mirkin, Lowry, and Kuehhle (1980) report that the results of three studies suggest that the dictated word list is a valid measure of spelling skill when compared to three standardized spelling achievement tests (TWS, PIAT spelling subtest, and SAT, spelling section). The finding was confirmed across grade levels, schools, and student samples. They found that generally, either the number of correctly spelled words or number of correct letter sequences could be used as the scoring procedures for the students in regular and learning disabled programs.

There have been many attempts to discuss whether a student learns better by one method or another. Westerman (1971) describes a technique, conceived by Keith Berry and further developed by herself and Diane Wilkinson, to determine by which method of input a student seems to learn spelling more effectively. It is used as an assessment and instructional technique. Appendix VI shows the teaching/testing technique. The basic steps for developing a modalities preference test are:

1. Pre-test to find 40 words that are unfamiliar to all the students in the group. It may be necessary to have several small groups.

2. Randomize the order of the words into five sets of eight words each.

3. Choose two words to teach in each of the five modablities for four consecutive days (total=10 words per day).

4. Test for recall at the end of each lesson. Keep track of the number of words learned via each modality.

5. On the fifth day, verbally administer all 40 words taught during the week and record the number of correct responses for each modality.

6. Encourage the students to actively participate in the experiment.

7. Give the students individual feedback regarding performance and make suggestions regarding study methods.

Before utilizing such a test, certain cautions must be kept in mind. There is no evidence of reliability and validity for the instrument; thus, do not make overgeneralizations. Newcomer and Hammill (1976) reviewed 13 studies regarding the relationships of tests of psycholinguistic ability, sensory modalities, and perceptual abilities to tests of spelling and found the correlations too small to be relevant.

Observation

Please see the section on mathematics for general guidelines regarding observation. Brueckman and Bond's (1955) guidelines for informal observation are very pertinent today.

1. Analysis of written work, including test papers.

   a. Legibility of handwriting.

   b. Defects in letter forms, spacing, alignment, size.

   c. Classification of errors in written work, letters or tests.

   d. Range of vocabulary used.

   e. Evidence of lack of knowledge of conventions or rules.

2. Analysis of Oral Responses.

   a. Comparison of errors in oral and written spelling.

   b. Pronunciation of words spelled incorrectly.

   c. Articulation and enunciation.

   d. Slovenliness of speech.

   e. Dialect and colloquial forms of speech.

   f. Ways of spelling words orally:

      1. Spells words as units.

      2. Spells letter by letter.

      3. Spells by diagraphs.

      4. Spells by syllables.

g. Rhythmic patterns in oral spelling.

h. Blending ability.

i. Giving letters for sounds or sounds for letters.

j. Technique of word analysis used.

k. Quality and error made in oral reading.

l. Oral responses on tests or word analysis.

m. Analysis of pupil's comments as he states orally his thought process while studying new words.

3. Interview with Pupil and Others

a. Questioning pupil about methods of study.

b. Questioning pupil about spelling rules.

c. Questioning pupil about errors in convention.

d. Securing evidence as to attitude towards spelling.

4. Questionnaire

a. Applying checklist of methods of study.

b. Having pupil rank spelling according to interest.

c. Surveying use of written language.

5. Free Observation in Course of Daily Work

a. Securing evidence as to attitudes toward spelling.

b. Evidence of improvement in the study of new words.

c. Observing extent of use of dictionary.

d. Extent of error in regular written work.

e. Study habits and methods of work.

f. Social acceptability of the learner.

g. Evidences of emotional and social maladjustment.

h. Evidences of possible physical handicaps.

6. Controlled Observation of Work on Set Tasks

a. Looking up the meanings of given words in dictionary.

b. Giving pronunciation of words in dictionary.

c. Writing plural forms of derivations of given words.

d. Observing responses on informal tests.

e. Observing methods of studying selected words (pp.369-370).

Appendix VII offers an example of an observational checklist that could be used as part of the informal assessment.

Error Pattern Analysis. This is one of the most valuable informal techniques as it is a simple technique that can be used with formal and informal tests. The basic guidelines in the mathematics section of this paper should be followed when performing an error pattern analysis. Spache (1940) stated that a minimum of 75 spelling errors was necessary in order to provide an accurate estimate of a student's error tendencies. He suggests that the initial step in error analysis is to categorize the errors. Spache (1940) identified 12 common error types for which Howell and Kaplan (1980 added examples.

1. Omission of a silent letter (e.g., wether for weather, reman for remain, fin for fine).

2. Omission of a sounded letter (e.g., requst for request, plasure for pleasure, personl for personal, juge for judge).

3. Omission of a doubled letter (e.g., suden for sudden, adress for address, sed for seed).

4. Doubling (e.g., untill for until, frriend for friend, deegree for degree).

5. Addition of a single letter (e.g., darck for dark, nineth for ninth, refere for refer).

6. Transposition or partial reversal (e.g., was for saw, nickle for nickel, bron for born.

7. Phonetic substitution for a vowel (e.g., prisin for prison, injoy for enjoy).

8. Phonetic substitution for a consonant (e.g., prixon for prison, cecond for second, vakation for vacation).

9. Phonetic substitution for a syllable (e.g., purchest for purchased, financhel for financial, naborhood for neighborhood, stopt for stopped).

10. Phonetic substitution for a word (e.g., weary for very, colonial for colonel).

11. Nonphonetic substitution for a vowel (e.g., rad for red, reword for reward).

12. Nonphonetic substitution for a consonant (e.g., watching for washing, inportance for importance) (p. 181).

In discussing error pattern analysis, Ganschow (1981) suggests that there are six assumptions the diagnostician must be aware of:

1. Errors children make are not random; they stem from children's hypotheses about the rules governing a particular task.

2. Some errors are more productive than others.

3. A systematic collection of errors children make on a specific task provides diagnostic information about a child's "rule" for that task.

4. Given sufficient samples of a child's work, teachers can simulate a child's rule system.

5. When asked, children may provide important cues to their strategies for a particular task.

6. Knowing a child's strategies will help teachers plan instruction.

Each of these assumptions is examined here as it relates to the task of learning to spell (p. 676).

Ganschow's (1981) steps for using error pattern analysis in spelling should be useful for the psychologist and/or classroom teacher:

1. The teacher collects samples of student writing.

2. The student's misspellings and the correct spellings are placed side by side, as shown in the example. A collection of at least 25 errors is suggested.

3. The erroneous strategy is surmised by the teacher, the student, or both, and recorded.

4. A solution to the problem (correction strategy) is suggested and recorded.

5. Correction strategies for all observed problems are placed in order, based on what teacher and student decide are the areas in need of most improvement (p. 680).

Marino (1981) gives examples of six error patterns and makes suggestions for instruction. Henderson (1980) points out that errors are either predictable or deviant. He suggests that there are four major categories of spellers and that it is important to find out where an individual student fits in the hierarchy of errors. His categories: (a) preliterate-prephonetic. The student does not know what words are, will put down letters, numerals, etc.; (b) preliterate-phonetic - The student does have the idea that letter names stand for the elements of the words; (c) letter-name strategy - The student spells known words correctly; and (d) vowel-transition - The student is able to spell some unknown words correctly. Westernam's (1971) examples of errors is a short but useful list: (a) substitution of beginning, medial or ending sounds; (b) missing syllables; (c) inversions or misplacements; and (d) additions.

Edginton's patterns of errors may assist the psychologist/diagnostician in structuring error analysis:

1. Addition of unneeded letters (e.g., dresses).
2. Omissions of needed letters (e.g., hom for home).
3. Reflections of a child's mispronunciation (e.g., pin for pen).
4. Reflections of a child's dialectical speech pattern (e.g., Cuber for Cuba).
5. Reversals of whole words (e.g., eno for one).
6. Reversal of vowels (e.g., braed for bread).
7. Reversal of consonant order (e.g., lback for black).
8. Reversals of consonant or vowel directionality (e.g., brithday for birthday).
9. Reversals of syllables (e.g., telho for hotel).
10. Phonetic spellings of nonphonetic words or parts thereof (e.g., cawt for caught).
11. Wrong association of a sound with a given set of letters, such as u has been learned as ou in your.
12. "Neographisms" such as letters put in which bear no discernible relationship to the word dictated.
13. Varying degrees and combinations of these or other patterns (pp. 58-59).

Error pattern analysis can be very useful in determining a student's learning strategies and should become a routine aspect of assessment

Task analysis. General guidelines for conducting a task analysis are in the section on Mathematics and Appendix III contains a task analysis of spelling by Westerman, 1971. More specific task analyses would be useful for planning instruction.

If one combines the various assessment techniques in order to pinpoint strengths and weaknesses in spelling skills, the next steps in the process are to prioritize the student's needs and plan for instruction. Much more has been written about regular classroom instruction in spelling than remedial instruction. However, many more well designed studies are needed in both area.

Instruction/Remediation in Spelling

Instruction

Horn (1954, 1960) made very basic suggestions for getting a student interested in spelling: (a) select genuinely useful words; (b) limited to those words student is unable to spell; (c) foster efficient study habits; (d) show student they are making progress; and (e) use materials that have inherent appeal.

Gentry and Henderson (1980) describe three basic steps to teaching beginning readers to spell: (a) encourage creative writing; (b) de-emphasize standard spelling; and (c) learn to respond appropriately to non-standard spelling.

As indicated in the introduction to spelling, controversy regarding certain aspects of instruction has been in existence for over 50 years and it is still present. The major areas of controversy are reviewed thoroughly by several authors and attempts have been made to make conclusions based on research. The following discussion will cover the major problem areas, not necessarily in order of their importance.

Selection of Words. Loomer and Strege (1983) chose 5,570 words from the New Iowa Spelling Scale (Greene and Loomer, 1977) for their new spelling program, Useful Spelling. The words represent 99.2% of the words that a student will need for today and as adults. The criteria they used for selecting the words were those suggested by Horn (1960): (a) frequency of use: (b) difficulty; (c) geographic distribution, (d) permanency; (e) spread, and (f) cruciality. The placement of words in the program was based on need, difficulty of the words, and phonetic difficulty within the words. Johnson, Langford and Quorn (1981) responded to Fitzsimmons and Loomers (1977) earlier work and indicated that the words chosen for spelling should only be those that the student is familiar with relative to pronunciation and meaning. They also suggest that the criteria for selection not be the most frequently used words, but those for which the students asks the spelling, words the students misspell, and words the teacher knows the students will need to know how to spell. They make several suggestions for individualizing word lists for students. The researchers, whose work centers on linguistics, such as Hanna and Hanna (1965a, b), Henderson and Beers (1980), Hodges (1981), Read (1973), Rudorf (1966), etc., would suggest that words be selected based on their linguistic properties. Loomer and Strege (1983) provide support for their selection process via a very thorough review of the spelling literature in their manual as well as very thorough reviews in earlier work by Loomer (Fitzsimmons & Loomer, 1974, 1977; Loomer, 1978).

Vocabulary lists vs. words in context. Loomer and Strege (1983) again cite several research articles supporting the viewpoint that it is more effective to present the spelling words as lists rather than in paragraphs or stories. However, Smith (1975) used five methods of teaching spelling to 359 junior high students and found that the approach that used words in context and the whole word method of learning was most effective.

Teach each word systematically. Loomer and Strege (1983) stress the importance of a systematic teaching approach which includes: (a) pronunciation and visual imagery; (b) immediate reproduction of the word; (c) reinforcement for immediate self-correction; and (d) systematic recall of words. Their suggested steps for the student are:

1. Look at the word.
2. Cover the word and write it.
3. Check the written word against the correct model.
4. If not correct, repeat steps 1, 2, and 3. If correct cover the word and the model, and write the word again.
5. Repeat the procedure three or four times for each word to be learned.

Effective study steps recommended by Horn in 1954 combine visual, auditory, and motor skills:

1. Pronounce each word carefully.
2. Look carefully at each part of the word as it is pronounced.
3. Say the letters in sequence.
4. Attempt to recall how the word looks and spell the word to oneself.
5. Check this attempt to recall.
6. Write the word.
7. Check this spelling attempt.
8. Repeat the above steps if necessary (p. 19).

Self-correction of spelling errors. Several studies are reported which support the view that the student should self-correct his/her own errors (Fitzsimmons & Loomer, 1974, 1977; Loomer & Strege, 1983). Johnson, Langford and Quorn (1981) suggest that the students go beyond correcting their own spelling tests to proofreading, seeking confirmation of their attempted spellings, and using the dictionary to check spelling.

The test-study vs. study test method. Considerable evidence is provided in Loomer and Strege (1983) as well as in Loomer's earlier work (Fitzsimmons & Loomer, 1974, 1977) to promote the use of pre-tests when students are learning to spell from word lists. Stanback (1980) reports there is overwhelming evidence of the effectiveness of this approach for the directed study of spelling, but it is unknown whether this approach would be effective when teaching spelling via a linguistic approach. Allred (1977) also reports several studies which support the test-study approach. In a recent study conducted by Stetson and Bouton (1980) in 25 second grade classrooms, it was found that half of the children scored 80% or better

on pretests. Thus, it would seem that at a minimum the study-test approach is a waste of time and could even be detrimental. The authors noted that the majority of spelling programs use a study-test approach.

Teaching rules vs. directed study. Loomer and Strege (1983) stress the importance of teaching students only those rules that apply to a large number of words, 80% or more of the time. Their viewpoint again is supported by much research and has as its foundation Ernest Horn's work at the University of Iowa. One of the long standing controversies regarding the teaching of spelling centers on the teaching of rules to enhance spelling competence. The three approaches used most often are: (a) teaching the rules that utilize a sound-letter approach; (2) teaching no rules because of the irregularity of the English spelling rules; or (3) teaching only those rules that apply to a large number of words, 80% or more of the time. Most of the current spelling programs combine the teaching of rules with some directed study, but the emphasis is on teaching rules and generalizations. There is no evidence to date to indicate that this is a more effective way to teach spelling. Research is needed to compare and contrast these two major approaches to teaching spelling. The researchers who have discovered developmental patterns of rules have no evidence that a linguistic approach to instruction will speed up or insure the acquisition of these rules. Allred (1977) reports that the most recent information concerning the use of spelling rules continues to support the earlier conclusions that knowing a given rule may furnish a child with a clue of how the word is spelled, but because of the complexity of the language and many exceptions to the rules, rules must be considered a helpful supplement to learning to spell but not the major method of instruction. Rules that seem sufficiently universal to be of value to the speller are found in Appendix VIII.

Teach whole words vs. parts. Research cited by Loomer and Strege (1983) supports teaching students to spell whole words rather than focusing on syllables or "hard spots." Stanback (1980) also reports no evidence for teaching students the "hard spots" in words. Johnson, Langford and Quorn (1981) also advocate the teaching of whole words.

Limited time for a spelling program. Loomer and Strege (1983); Johnson, Langford and Quorn (1981) provide evidence that a spelling program of 60-75 minutes per week should be sufficient for maintaining and improving spelling. Stanback (1980) also discusses distributed vs. mass learning of spelling and indicates that for the good speller it may not matter, but the poor speller may need daily practice.

The Useful Spelling program. Loomer and Strege's (1983) new spelling program is based on research findings and their major goals are for the students to grow in spelling ability and to maintain that growth over a period of time. Other features of their program which are not really controversial are to use spelling games only when they appropriately supplement systematic instruction, to provide systematic and periodical evaluation of student progress, and to develop a positive attitude toward spelling. The Useful Spelling program contains many more specific instructions. It is made clear that not all children would be working on the same word lists at the same time. There are four separate spelling programs contained within the Useful Spelling program, reportedly geared for schools whose students have poor spelling ability as well as for schools whose students have outstanding spelling ability.

Summary. Westerman (1971) advocates an integrated approach to learning to spell as she believes that it is more effective to learn to hear, speak, read, spell, and write the same words. No one knows whether the integrated approach is any more effective than any other approach. Research is needed! Hammill, Larsen, and McNutt (1977) located 100 teachers of children in grades 3-8, who were willing to participate in a study of the effects of spelling instruction. The children in the teachers' classes were given the Test of Written Spelling (TWS) and the teachers were asked to indicate what method they used to teach spelling. The children were divided into five subgroups based on type of instruction: (a) those children receiving instruction in the Spell Correctly program (26%); (b) those children receiving instruction in the Word Book program (16.7%); (c) those children receiving instruction in Basic Goals in Spelling; (d) those taught by other methods (29.6%); and (e) those receiving no instruction (13.4%). The major results showed that students in grades 3-4 who received systematic instruction scored higher than those with no instruction. For grades 4-5, children receiving instruction in Basic Goals in Spelling obtained the lowest TWS scores. The children with no instruction scored better. For grades 7-8, the children receiving instruction from Word Book and Spell Correctly were the most proficient spellers. The authors point out that after grade 4, no instruction in spelling produced spellers almost as proficient as those who received instruction. These results confirm that there are no answers regarding the best method of spelling instruction. New programs such as that developed by Loomer and Strege (1983) certainly should be investigated along with linguistic based programs.

There are valuable resources that provide suggestions for remediation and it is known that various approaches do seem to work for individuals. Graham, Freeman, and Miller (1981) and Hodges (1981) describe games and activities that can be used as supplements to the regular spelling program.

Remediation

Wallace and Larsen (1978) suggest that the cloze procedure could be used for assessment and remediation of spelling difficulties. However, they point out that it is not a useful technique if the particular words are not in the student's oral vocabulary or if the reading level is not appropriate for the student.

Hammill (1978) reviews several remedial techniques that have been in existence for a long time such as Fernald's (1943) multi-sensory approach to spelling. A multi-sensory approach is now advocated for most instruction programs in spelling, not just remedial programs. The basic steps to the approach are:

a. Written presentation of the word.

b. Teacher pronounces the word, students pronounce the word.

c. Students study the word.

d. Word is covered, students write words from memory.

e. Word is written again.

f. Student is given opportunities to use the word in written expression.

g. Student is allowed to seek verification of the spelling when not sure.

h. Spelling matches or "bees" should be written not oral.

More detail regarding these steps is provided by Fernald (1943). Hammill (1978) also briefly reviews alphabetic, sensory, phonovisual and visual techniques.

Cicci (1980) suggests that an analysis of the words to be spelled is important before beginning instruction as a student may have underlying auditory-processing problems. She suggests that a syllable approach to spelling, that follows a close phoneme-grapheme correspondence, may be useful for children with auditory discrimination problems, while a tachistoscopic presentation combined with oral and written spelling of the word should be appropriate for those words that are best learned via visual memory.

Johnson and Myklebust (1967) suggest that words be separated into those that are phonetic and those that are not for remedial instruction. Their suggested remedial techniques varied from separating words into syllables when reading and writing to typing spelling words.

Sulzby (1980) suggests that "word sorts" be used as both diagnostic and instructional techniques in spelling. They would be most useful when using a linguistic approach to spelling instruction or when it is desirable to know what spelling rules/generalizations a student is aware of. The basic steps for a word sort are as follows:

1. Decide, with the child, the categories to be sorted and make a place for "leftovers."

2. Let the child sort the word cards under the title or exemplar for each category; put leftovers in the leftover pile.

3. Redefine the category: have the child restate the pattern he is using for sorting.

4. Ask for reaffirmation of choices: ask the child to go down each list and tell you if each one fits the category (strength of decision).

5. Make some distinction between members that fit the category very well and those that are "fuzzy" yet do not quite belong in the leftover pile.

6. Ask for a redefinition of the rule for generalization. Now the child has a rule and clear members, clear nonmembers and borderline cases distinguished from one another.

7. Optional, but very fruitful: Collect word sort lists in a personal wordbook or thesaurus. One convention for "fuzzy" words that we have used in wordbooks is to put borderline cases in parentheses. Often a child will decide to remove a parenthesis and declare, "Now that word fits." (p. 132).

Bryant, Drabin, and Gettinger (1981) investigated the effects of unit size on the spelling achievement of learning disabled children and found that significantly more of the children who had been taught three new words a day reached 80% mastery on the spelling post-test compared to the children who had been taught four or five new words a day. There were no significant differences in the average total words learned by the students. All students learned to spell between seven and eight new words over the three-day period regardless of the actual number of words presented to them. The difference was in the mastery of the nine common words taught to all of the students. Stanback (1980) reports that there is not much research available regarding unit size but that it appears the poorer speller needs fewer words.

Stanback (1980) reviewed the remedial programs that were in existence at the time of her review (1978) and concluded that there is no evidence pointing to the superiority of one remedial method/program over another. Remediation in spelling as in most other curricular areas must continue to be individualized instruction geared to the specific needs of each student. It is necessary to continuously evaluate the effectiveness of instruction.

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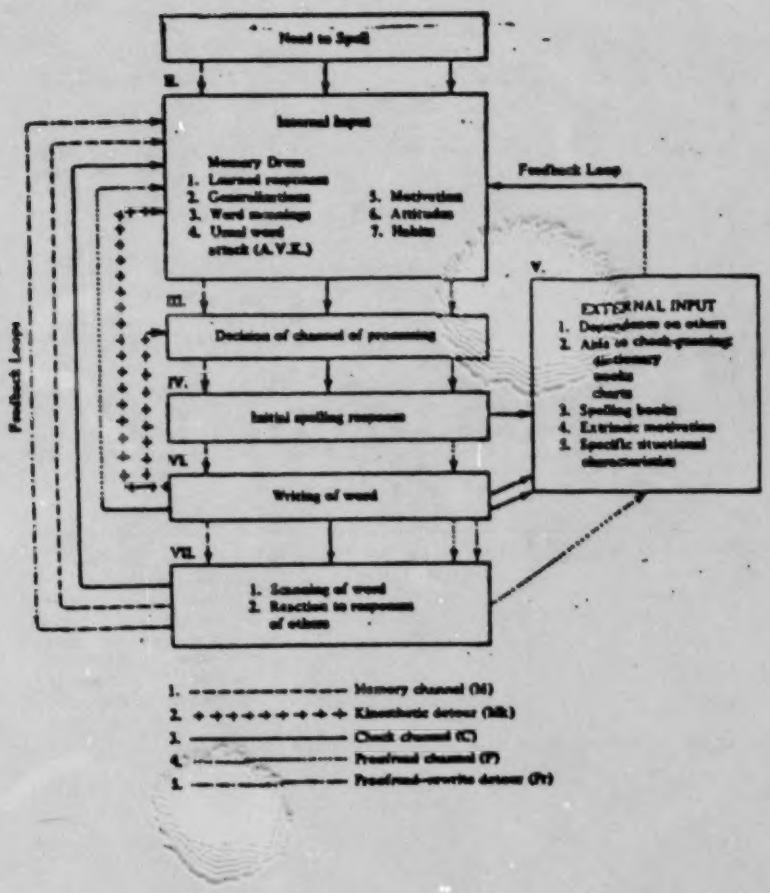
APPENDIX

APPENDIX I

Theoretical Model of Spelling Behavior



Source: Personke, C. & Yee, A. H. A model for the analysis of spelling behavior. In T. Korth (Ed.) Research in handwriting and spelling. Champaign, Illinois: National Council of Teachers of English, 1966.

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APPENDIX II

Figure 1. Personke & Yee Model (adapted)

CHANNEL	STRENGTHS	WEAKNESSES
Memory Kinesthetic Detour Channel	Quickest, most efficient; allows one to "write without thinking", one eventual goal in spelling.	Only useful for stored words; words are reinforced whether right or wrong, leading to problems of "negative practice".
Memory Channel	Responses more likely to be correct due to more careful information processing.	Requires conscious thought, provides "conceptual break" in writing process.
Checking Channel	Speller always has a correct response due to checking before writing; only a correct response is fed back to the memory drum.	Conceptual break greatest in this method due to time loss in finding information.
Proofread Channel and Proofread-Rewrite Detour	Less conceptual break here; more chance of child actively problem-solving by using his own sources first.	Great disadvantage of possibly reinforcing an incorrect written response which eventual correct response may not eliminate; can alleviate this problem by not assuming "correctness" when writing the first response.

Source: Westerman, G. Spelling & Writing, San Rafael, California: Dimensions Publishing Co., 1971.

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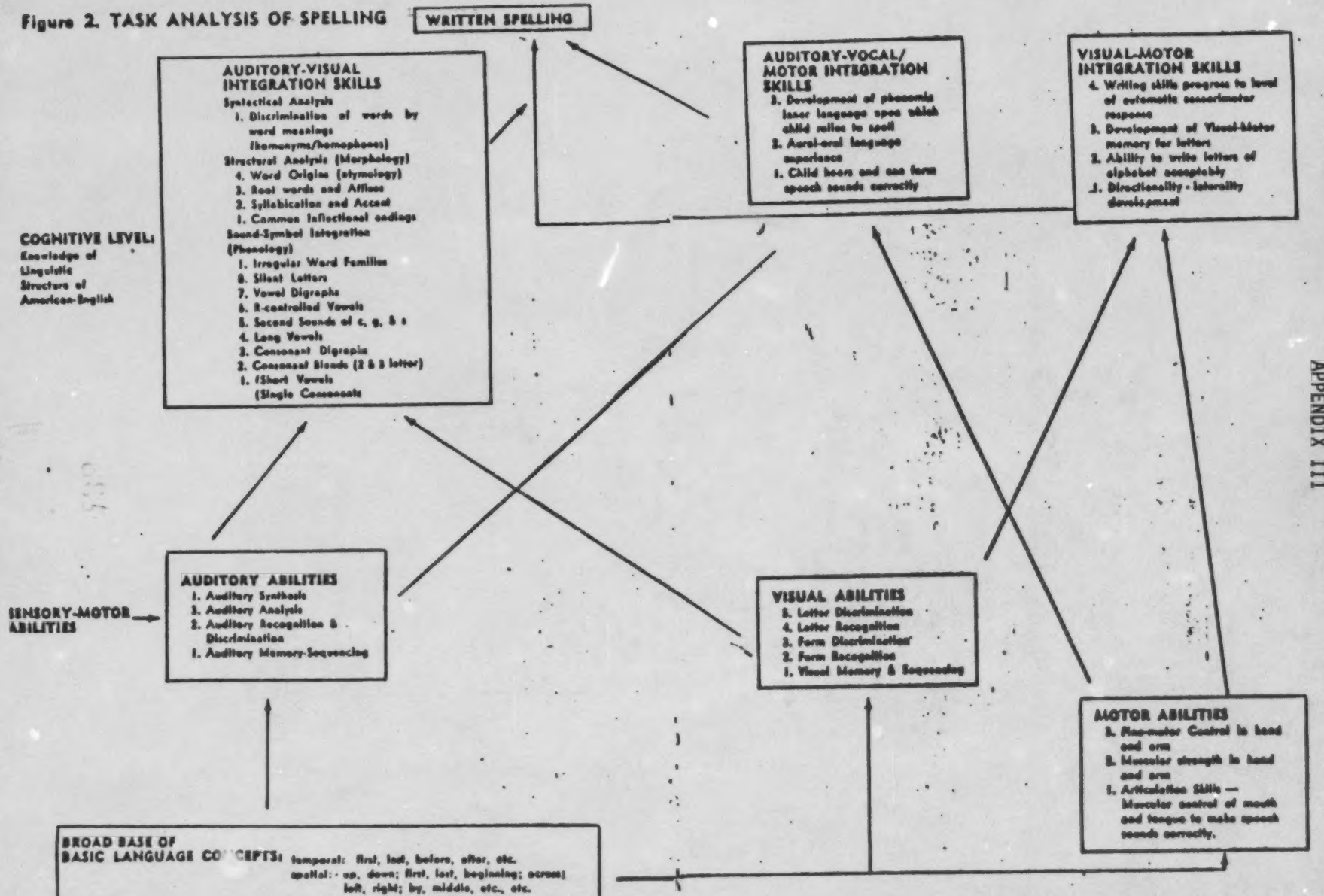
Figure 2. TASK ANALYSIS OF SPELLING


WRITTEN SPELLING
AUDITORY-VISUAL INTEGRATION SKILLS
Syntactical Analysis
1. Discrimination of words by word meanings (homonyms/homophones)
Structural Analysis (Morphology)
4. Word Origins (etymology)
3. Root words and Affixes
2. Syllabication and Accent
1. Common inflectional endings
Sound-Symbol Integration (Phonology)
11. Irregular Word Families
10. Silent Letters
9. Vowel Digraphs
8. R-controlled Vowels
7. Second Sounds of c, g, & s
6. Long Vowels
5. Consonant Digraphs
4. Consonant Blends (3 & 2 letter)
3. Short Vowels
2. Single Consonants
AUDITORY-VOCAL/ MOTOR INTEGRATION SKILLS
3. Development of phonemic inner language upon which child relies to spell
2. Aural-oral language experience
1. Child hears and can form speech sounds correctly
VISUAL-MOTOR INTEGRATION SKILLS
4. Writing skills progress to level of automatic sensorimotor response
3. Development of visual-kinetic memory for letters
2. Ability to write letters of alphabet acceptably
1. Directionality - laterality development
COGNITIVE LEVEL: Knowledge of Linguistic Structure of American-English
SENSORY-MOTOR ABILITIES
AUDITORY ABILITIES
1. Auditory Synthesis
3. Auditory Analysis
2. Auditory Recognition & Discrimination
1. Auditory Memory-Sequencing
VISUAL ABILITIES
5. Letter Discrimination
4. Letter Recognition
3. Form Discrimination
2. Form Recognition
1. Visual Memory & Sequencing
MOTOR ABILITIES
3. Fine-motor Control in hand and arm
2. Muscular strength in hand and arm
1. Articulation Skills — Muscular control of mouth and tongue to make speech sounds correctly.
BROAD BASE OF BASIC LANGUAGE CONCEPTS: temporal: first, last, before, after, etc.
spatial: up, down; first, last, beginning; across; left, right; by, middle, etc., etc.
general: "not"; rhyme; same, different; comparatives (big, bigger, biggest); etc.

Source: Westerman, G. Spelling & Writing, San Rafael, California: Dimensions Publishing Co., 1971.

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APPENDIX IV

Table 1
Spelling Pattern Sequence in Selected Categories

Short *e* as in *met*
1. *a* for *e* - GAT (*get*)
2. *i* for *e* - WINT (*went*)
3. correct form

Short *i* as in *sit*
1. *e* for *i* - MES (*miss*)
2. correct form - MIS (*miss*)

Long *a* as in *gate*
1. correct form - GAT (*gate*)
2. *e* for *a* - GET (*gate*)
3. *ay* or *ae* for *a* - GAETT (*gate*)
4. correct form - GATE

Long *e* as in *feet*
1. *e* for *ee* - FET (*feet*)
2. *i* for *ee* - FIT (*feet*)
3. *ea* for *ee* - FEAT (*feet*)
4. correct form

Nasal consonants - single letter
1. correct form when not part of a blend - CAM (*came*), MENE (*many*)
2. omitted when part of a blend - JOP (*jump*), WAT (*went*)
3. emergence of *m*, *n* in consonant blend - WANT (*went*)

Flaps as in *patter* and *later*
1. *d* for *t* or *tt* - FIDER (*pitter*), SWEDER (*sweater*)
2. *t* for *tt* or *tt* for *t* - BITTIG (*biting*), LITL (*little*)

Morphological ending
ed as in *wanted*
1. *d* substituted for *ed* - FETD (*painted*)
2. *id*, *ud*, *ad* for *ed* - STARETID (*started*)

ed as in *passed*
1. *t* for *ed* - NOCT (*knocked*)
2. *et* for *ed* - DRESET (*dressed*)

Source: Beers, J.W. Developmental strategies of spelling competence in primary school children. In E. H. Henderson & J.W. Beers (Eds.) Developmental and cognitive aspects of learning to spell: A reflection of word knowledge. Newark, Delaware: International Reading Association, 1980.

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TABLE 10-6 ISI Developed upon the Basal Program *Spell Correctly*

Level II	Level III	Level IV
1. am	1. able	1. across
2. bake	2. belong	2. anyhow
3. boy	3. came	3. bench
4. chin	4. duck	4. brush
5. down	5. fork	5. church
6. fast	6. hay	6. curve
7. go	7. jar	7. drink
8. he	8. kitten	8. everyone
9. hot	9. mile	9. flow
10. jet	10. nice	10. gold
11. lot	11. pony	11. held
12. man	12. seed	12. kitchen
13. on	13. sky	13. mix
14. ran	14. study	14. number
15. sand	15. tar	15. pail
16. stop	16. tie	16. ranch
17. trip	17. trap	17. sharp
18. us	18. van	18. tooth
19. when	19. wagon	19. windy
20. yes	20. wrote	20. young

Level V	Level VI	Level VII	Level VIII
1. accident	1. abroad	1. abnormal	1. abdicate
2. autumn	2. adventure	2. amusement	2. applause
3. belt	3. attractive	3. burden	3. butcher
4. build	4. chapter	4. captain	4. chaotic
5. cellar	5. cycle	5. clumsy	5. curiosity
6. crumb	6. desire	6. democracy	6. delicate
7. duty	7. employ	7. enemies	7. evict
8. feather	8. favorite	8. fifteen	8. galaxies
9. ghost	9. gain	9. generalize	9. hydrogen
10. height	10. however	10. hundred	10. legalize
11. lake	11. jury	11. intelligent	11. motivate
12. meal	12. lunar	12. knowledge	12. pecans
13. own	13. nervous	13. metric	13. prologue
14. pledge	14. owner	14. nourish	14. revision
15. rent	15. perfect	15. pioneer	15. squire
16. search	16. prove	16. quirk	16. tactics
17. streaming	17. shake	17. reject	17. umbrella
18. thirstiest	18. tank	18. scarce	18. vivid
19. wasn't	19. usually	19. telephone	19. vision
20. yearn	20. yourself	20. wrecked	20. woven

Source: Wallace, G. & Larsen, S. C. Educational assessment of learning problems: Testing for Teaching. Boston: Allyn and Bacon, Inc., 1978.

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APPENDIX VI

Figure 3. SENSORY MODALITY PREFERENCE TESTING (Beery, Westerman, Wilkinson, 1968)
Criterion Task: WRITTEN SPELLING
Behavioral Objective: Given 40 spelling words orally, child will write each word correctly after one week of instruction.

Modalities:	Auditory-Vocal	Auditory-Motor	Visual-Vocal	Visual-Motor	Multi-Sensory
TEACHER	1. Say word ("This is the way to spell 'chart' ") 2. Spell word aloud (c-h-a-r-t) 3. Say word again ("chart") 4. "Say the word and spell it for me."	1. Say word. 2. Spell word aloud. 3. Say word again. 4. "Write the word I have just spelled."	1. Show word on card. 2. Name word (do not spell orally) 3. "Look at the word, say it, then spell it for me."	1. Show word on card. 2. Name words. 3. "Look at this word and write it on your paper."	1. Show word on card. 2. Name word. 3. Spell orally. 4. "Look at this word and spell it for me." 5. Now write it on your paper."
PUPIL	1. Say word ("chart") 2. Spell aloud (c-h-a-r-t)	1. Write word on paper.	1. Say word. 2. Spell orally. 3. Say word again.	1. Copy word from flash card. 2. Cover sample. 3. Write word again — check back and forth until spelled correctly.	1. Say word. 2. Spell orally. 3. Write on paper.
TEACHER	1. If error in student response, say "Almost, Bob — you try it John" - Then go back to Bob. 2. After everyone has spelled back word correctly 4 times, say "Now everyone write 'chart' "	1. Repeat spelling orally for correction. 2. After writing word correctly 4 times, say "Turn your paper over and write _____."	1. After each child has responded, take word away. 2. Ask each student to spell from memory. 3. After 4 correct responses from each child, say "Everyone write _____."	1. After 4 correct responses, tell children to turn paper over and write word from memory.	1. After each child has responded, cover card. Ask students to spell orally from memory (2 times); then write from memory (2 times.) 2. "Now turn your paper over and write _____."
PUPIL	1. Write word on paper from memory. 2. Hold paper up for correction. DO NOT SHOW FLASH CARD.	1. Write word on paper from memory. 2. Hold paper up for correction. DO NOT SHOW FLASH CARD.	1. Write word on paper from memory, (Correct with flash card)	1. Write word on paper from memory. (Correct with flash card).	1. Write word on paper from memory. (Correct with flash card).

Source: Westerman, G. Spelling & Writing. San Rafael, California: Dimensions Publishing Co., 1971.

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FIGURE 10-1 Checklist for Specifying Spelling Errors

_____ 1. Consonant sounds used incorrectly (specify letters missed)
_____ 2. Vowel sounds not known
_____ 3. Sounds omitted at beginning of words
_____ 4. Sounds added at the beginning of words (e.g., a blend given when a single consonant required)
_____ 5. Omission of middle sounds
_____ 6. Omission of middle syllables
_____ 7. Extraneous letters added
_____ 8. Extraneous syllables added
_____ 9. Missequencing of sounds or syllables (transposals like "from" to "form"
_____ 10. Reversals of whole words
_____ 11. Endings omitted
_____ 12. Incorrect endings substituted ("ing", for "en" or for "ed")
_____ 13. Auditory confusion of *m/n*, *th/f*, *s/z*, or *b/d* or other similar sounds
_____ 14. Phonetic spelling with poor visual recall of word appearance
_____ 15. Spelling laborious, letter by letter
_____ 16. Poor knowledge of "demons" (e.g., one, iron, forecastle)
_____ 17. Spells, erases, tries again, etc., to no avail
_____ 18. Reversals of letter shapes *b/d*, *p/q*, *u/n*, or *m/w*
_____ 19. Spelling so bizarre that it bears no resemblance to original; even pupil cannot read his own written words
_____ 20. Mixing of upper and lower case letters
_____ 21. Inability to recall how to form either case for some letters
_____ 22. Spatial placement on line erratic
_____ 23. Spacing between letters and words erratic
_____ 24. Poor writing and letter formations, immature eye-hand coordination
_____ 25. Temporal disorientation: slowness in learning time, general scheduling, grasping the sequence of events in the day and those
_____ 26. Difficulty in concept formation; not able to generalize and transfer readily to abstract "the rules and the tools"

Source: Partoll, S. F. Spelling demonology revisited. *Academic Therapy*, 1976. XI. 339–348. Used with permission of the author and the publisher.

Reprinted from Wallace, G. & Larsen, S. C. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, Inc., 1978.

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1. Some rules governing the addition of suffixes and inflected endings are:

   a. Words ending in silent *e* drop the *e* when adding a suffix or ending beginning with a vowel and keep the *e* when adding a suffix or ending beginning with a consonant.

bake	manage
baking	managing
baker	management

   b. When a root word ends in *y* preceded by a consonant, the *y* is changed to *i* in adding suffixes and endings unless the ending or suffix begins with *i*.

fly	study
flies	studying
flying	studious
	studies

   c. When a root word ends in *y* preceded by a vowel, the root word is not changed when adding suffixes or endings.

play	monkey
playful	monkeys

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d. When a one-syllable word ends in a consonant with one vowel before it, the consonant is doubled before adding a suffix or ending beginning with a vowel.

run	ship
running	shipping
	shipment

e. In words of more than one syllable, the final consonant is doubled before adding a suffix or ending if: (1) the last syllable is accented, (2) the last syllable ends in a consonant with one vowel before it, and (3) the suffix or ending begins with a vowel.

begin	admit
beginning	admittance

2. The letter *q* is always followed by *u* in common English words.

queen	quiet

3. No English words end in *v*.

love	glove

4. Proper nouns and most adjectives formed from proper nouns should begin with capital letters.

America	American

5. Most abbreviations end with a period.

etc.	Nov.

6. The apostrophe is used to show the omission of letters in contractions.

don't	haven't

7. The apostrophe is used to indicate the possessive form of nouns but not pronouns.

boy's	its
dog's	theirs

8. When adding *s* to words to form plurals or to change the tense of verbs, *es* must be added to words ending with the hissing sounds (z,s,sh,ch).

glass	watch
glasses	watches

9. When *s* is added to words ending in a single *f*, the *f* is changed to *v* and *es* is added.

half	shelf
halves	shelves

10. When *ei* or *ie* are to be used, *i* usually comes before *e* except after *c* or when sounded like *a*. (Note these exceptions: leisure, neither, seize, and weird.)

believe	neighbor
relieve	weigh

Source: Read, E. A., Allred, R. A., & Baird, L.O. Continuous progression spelling: Intermediate teachers manual. Oklahoma City, Individualized Instruction, Inc., (The Economy Company), 1972, Reprinted from Allred, R. A. Spelling - The application of research findings . Washington, D.C., National Education Association 1977.

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Written Expression

Written Expression

Introduction

Poteet (1980) indicates that the components of written expression are penmanship, spelling, grammar, and ideation while Weiner (1980a) believes that written expression is made up of graphic, orthographic, phonologic, syntactic, semantic, and self-monitoring components. Hammill and Poplin (1978) believe that writing includes penmanship or handwriting, syntax, and generation of ideas for writing and Starlin (1982) divides the writing curriculum into nine areas: (1) handwriting; (2) spelling; (3) capitalization; (4) punctuation; (5) sentence structure; (6) paragraph structure; (7) grammatical usage; (8) vocabulary usage; and (9) creative writing. All would agree that there is a hierarchy in written expression and that written language is a difficult language activity. Cicci (1980) states that the expression of ideas through writing is the last of the language art skills acquired by students.

Both in the popular press and the professional journals, it has been indicated that the writing skills exhibited by students are not within age level expectations. Analysis of adult handwriting by Templin (1960) demonstrated a need for handwriting instruction, even for maintenance of earlier learned skills. Spandel and Stiggins (1980) report that a 1975 study by the National Assessment of Educational Progress (NAEP) revealed that over a five year period of time, there was an increase in writing problems exhibited by 13 and 17-year-olds. The problems were evidenced by run-on sentences, incoherent paragraphs, inappropriate language usage, inadequate sentence structure and rambling prose. Practical guidance for improving writing was not included in the NAEP report. In 1979 the Wisconsin Pupil Assessment Program conducted a nationwide survey to determine what the various states were doing regarding writing assessment and intervention. Eighteen states reported that they had writing assessment programs and five states indicated they were planning assessment programs. Starlin (1982) reports that in January of 1981 he listened to an NBC Nightly News Report which indicated 25% of the secondary students sampled were not proficient in one or more of the basic writing skills. The students who had been interviewed indicated there was little writing instruction in school and little opportunity to practice writing. There appears to be more time spent on word usage and mechanics than handwriting or creativity.

There is current concern about written expression and it is evidenced by the development of either optional or required writing assessment for the SAT and ACT, an increased number of statewide writing assessment programs, and an increased number of articles in the professional literature regarding the assessment of written language. Hadley (1977) points out that students need help when their writing is not readable or legible to others, while Hammill and Poplin (1978) state that persistence of errors in writing is indicative of writing problems. Desired minimal comptencies for all students appear to be that their writing be legible and that they are able to express their thoughts in writing well enough for others to understand them.

If a student is having problems in writing, what are the appropriate steps to take? A first step towards the assessment of writing is to determine what skills are necessary for the various components of written expression and what factors influence the development of these skills.

Factors Influencing Writing Skills

Wallace and Larsen (1978) report that the following is needed for successful written expression: (1) adequate spoken language; (2) organization of thought processes; (3) knowledge of the grammatical and syntactical aspects of written language; (4) proficient spelling; (5) motor control for good handwriting; and (6) familiarity with the convention of sentence and paragraph sense, capitalization, and punctuation. Hadley (1977) suggests that a student's general health, coordination, and vision could effect handwriting.

Cicci (1980) suggests that the following questions should be asked if there is concern about the legibility of a student's handwriting: (1) Is the pencil grasp appropriate; (2) Is there tension on holding the pencil; (3) Is the paper positioned and held correctly; (4) Is there a problem with the coordinated motor act of writing; (5) Is the rate of writing adequate; and (6) Does the product reflect the process? Relative to problems with written formulation, she suggests that these questions be asked: (1) Does the student have a spoken language problem; (2) Is there a reading problem; (3) Is there a difference between oral and written language; (4) On what written tasks does the student have difficulty; and (5) Is there a problem with written homework?

The studies conducted by Myklebust (1965) and Johnson and Myklebust (1967) indicate that problems in writing are due to deficiencies in visual-motor integration (dysgraphia), revisualization (memory), and formulation (syntax). However, Hammill and Poplin (1978) believe that a more useful way of looking at writing problems is to consider deficiencies in readiness, penmanship, and/or conceptual writing. Their definition of readiness for writing includes basic perceptual-motor and linguistic experiences while legibility and speed are needed for good penmanship, and grammatical accuracy and meaningfulness are necessary for conceptual writing. Appendix I contains an excerpt from the Basic School Skills Inventory, which can be used as a means of determining what factors might influence handwriting skills as well as an assessment of handwriting skills.

Weiner (1980b) studied the writing samples of 14 reading disabled and 17 control students to determine if there were qualitative or quantitative differences in the writing skills of these students. The Diagnostic Evaluation of Writing Skills (DEWS) was used to evaluate the students' writing samples. The evaluations were conducted by raters who did not know the identity of the subjects. The results indicated that the controls wrote almost twice as many words as the reading disabled, although there was no significant difference between the groups in amount of time taken to complete the task. The reading disabled children made more phonologic errors than the controls, but there were no other significant differences between the two groups.

Sequence of Skills

The broad spectrum of writing skills was presented in the introduction, but in order to develop assessment and remediation plans for written expression, a psychologist and/or diagnostician needs to know exactly what skills a student has already acquired and correctly uses and what skills need remediation. It is helpful to know what skills were formally introduced and when they were introduced to students.

Knowledge regarding the scope of skills must be obtained as a reference point for judgments regarding a student's writing. Scope and sequence charts can be obtained from the language arts textbooks being used or from state or local curriculum guides. Appendix II contains an example of a scope and sequence chart that was adapted by Hammill and Poplin (1978) and Appendix III contains a broad spectrum of skills necessary for written expression.

The skills that are taught for handwriting, punctuation, and capitalization are similar across language arts programs series, thus Wallace and Larsen's (1978) adapted list of goals and Green and Petty's (1967, 1975) outlines of skill development in punctuation and capitalization should serve as useful models when determining the scope of students skills in writing (Appendices IV, V, and VI).

Starlin (1982) has listed 17 outcome goals for the writing curriculum. He then discusses and provides examples for the curriculum ladder and "slicing" concept which are part of his tactics for teaching. His curriculum ladders do not provide the sequence for introducing skills, but instead a listing of the skills, whereas the "slicing" consists of breaking down each step of the curriculum ladder into as many specific skills as needed. Slicing entails changing to a curriculum with more and/or different concepts when the students are proficient and changing to a curriculum with fewer and/or different concepts when the students are frustrated. His examples serve as models if a psychologist/diagnostician or teacher wished to further "slice" the skills in a scope and sequence chart. The concept of slicing would be applicable to assessment and remediation. Appendix VII contains a reprint of Starlin's (1982) slicing of handwriting skills.

The Diagnostic Process

Because there are very few specialists in written language disorders, the school psychologist will be involved in the diagnostic process, and the analysis of the referral is the first step in the process. If some concern regarding any aspect of written expression is noted on the referral, then the psychologist must attempt to find out what is already known concerning the student and his/her writing skills. It is necessary for the psychologist to be familiar with the scope and sequence of writing skills that have already been introduced to the student, which skills are appropriate for the student's grade placement, the requirements of the writing tasks the student has failed, the instructional programs available to the student, and the student's desire to perform writing tasks.

The various questions listed under factors influencing writing skills need to be answered. The questions that Hammill (1978) suggested should be asked when a student fails spelling are appropriate questions to adapt for writing difficulties:

1. Does the student have sufficient mental ability for writing?
2. Does the student have adequate motor development for writing?
3. Are the student's hearing, speech/oral language, and vision within normal limits?
4. What is the student's broad level of writing ability?
5. Are there specific areas of weakness in writing?
6. What techniques have been used for instruction and/or remediation in writing?

If this initial analysis of the referral indicates additional information is needed, then decisions must be made as to what techniques will be used to collect data and who will collect the data. The most effective diagnostic process is one where the psychologist, classroom teacher, and anyone else involved in the student's writing experience will work together to determine and conduct appropriate assessment.

There are very few standardized tests of written expression, yet there are many assessment techniques for writing now being developed and used. The majority of the new techniques have been developed for particular states or school districts as a means of evaluating the writing skills of all the students rather than as individual assessment instruments designed to determine individual strengths and weaknesses. It is doubtful that the school psychologist will use one of these statewide systems, but he/she does need to know their purpose, procedure, and scoring and evaluation criteria. Anderson (1980) and Spandel and Stiggins (1980) indicate the purposes of these assessment programs can be divided into three broad categories: instructional management, screening, and program evaluation. Instructional management includes diagnosis of strengths and weakness, placement decisions, and guidance and counseling. The screening of students is usually for entry or exit into programs and/or for certification of skill level. Evaluation of programs may be done simply to survey trends or indicate general progress. It may be done to provide formative evaluation which will indicate which features of a program are effective and which need revision or to provide summative evaluation which will indicate the program's overall merit.

The major controversies regarding these tests center around: (1) whether direct or indirect measures of writing skills should be used, and (2) what scoring methods should be used to analyze direct samples of a student's writing. Relative to the type of measure used, Spandel and Stiggins (1980) state that objective tests (non-direct measures) can be used for measuring some of the language usage skills that are deemed important, but that when resources are available, direct assessment of writing samples is best. They believe that the skills to be measured must be specified, writing exercises must be developed and there must be at least two trained readers.

Clemson (1978) compared students' scores on an objective measure of writing skills and on a writing sample. The students who scored well on the objective measure also scored well on the sample of writing. The relationship was stronger between objective scores and holistically scored writing samples rather than samples scored more specifically.

Hogan and Mishler (1979) question the value of a multiple choice test to assess writing skills. They believe that a simple rather than complex system of rating writing samples is more beneficial and they recommend that holistic scoring be used for minimum competency testing and analytical scoring and/or objective tests be used as back-up measures. They report that the holistic and analytic scoring systems are equally reliable. They believe that the individual classroom teacher can rate their students' writing skills because the procedure is not lengthy once the system is developed. They also state that periodic rating by more than one rater is desirable.

Hudson and Veal (1981) conducted a survey of 24 high schools in Georgia to determine whether direct or indirect measures of writing were used. They found that the objective test of writing was inexpensive to score, but that the holistic method of scoring writing samples was the most widely used and most economical measure. The analytical method of scoring writing samples was the most expensive measure.

The type of scoring used for direct measures of writing depends on many factors, but a major factor is the purpose of the assessment. Appendix VIII shows a comparison of three types of scoring. Analytic scoring isolates one or more characteristics of writing and is best when specific information is needed regarding the student's punctuation, etc.; Primary Trait scoring is situationally specific scoring for mechanics and grammar; and Holistic scoring is used to obtain an overall impression of the writing. Myers (1980) compared Holistic, Analytic, and Primary Trait scoring and found Holistic scoring to be the most reliable. Humes (1980a) points out that the terms for scoring are used inconsistently, one or more writing samples should always be scored, and with Holistic scoring there is no pinpointing of strengths and weaknesses. Hogan and Mischler (1979), Spandel and Stiggins (1980), and Cronnell (1980) all believe that a regular classroom teacher can reliably score writing samples if skills are clearly and concisely defined by writing experts. In addition, Spandel and Stiggins (1980) believe there must be a link between skills and assessment and raters must be carefully trained. Cronnell (1980) found that there was a high degree of agreement, in scoring writing samples, between classroom teachers and the staff of the Southwest Regional Laboratory (SWRL). He believes a necessary ingredient for reliable scoring is a well designed scoring guide. Humers (1980a) reports that the scoring system developed at SWRL provides more diagnostic information than Holistic or Primary Trait scoring and that the scoring of samples is rapid and reliable. She believes that this system will result in diagnostic information that can be used to ameliorate instructional inadequacies and assure student learning.

It is clear that if the overall aspects of a student's writing skills need to be evaluated, direct samples of written work must be obtained. Some of these district and statewide writing assessment

programs could serve as useful models for the schools the psychologist works in or even for individual psychologists and classroom teachers that are considering overall assessment of written expression (Cronnell, 1980; Humes, 1980a, b; Humes, et al.,1980; Roberts, 1979).

Formal Assessment

If there is limited or no information regarding how the referred student compares to others in either overall writing skills or in one or more of the components of written expression, then it may be necessary to administer a standardized test for classification and/or labeling purposes. Generally, the standardized test will have to be supplemented with informal techniques.

Handwriting is one of the components of written expression that has been formally evaluated for a long time. Anderson (1966) reports assessment occurring in 1910. However, Anderson (1966), Petty (1966), and Westerman, 1971) point out that few schools actually conduct handwriting assessment using a scale. Assessment is either not carried out or it is done subjectively without any set criteria. The reliability of evaluating handwriting is much better when scales are used (Anderson, 1966).

One of the most widely used scales for assessing handwriting is the Zaner-Bloser Evaluation Scale, which was previously known as the Freeman Scale. Westerman (1971) and Hammill and Poplin (1978) provide some information regarding handwriting scales. These scales can provide a gross evaluation of a student's handwriting and indicate whether he/she is behind other students the same age, but they will not provide information specific enough to plan a remedial program. Techniques such as error pattern analysis would be necessary for planning.

The Ayres Scale was developed in 1912 and revised in 1917 and 1920. The criterion for quality is readability. The scale assesses only cursive writing and is not graded. The Freeman Scale was developed in 1915 and revised in 1959. It was revised in 1968 as the Zaner-Bloser Evaluation Scale. The criteria for quality includes five factors: letter form, uniformity of slant, uniformity of letter alignment, quality of line, and spacing between letters and words. The students' writing samples are assigned to one of three groups according to teacher judgment, then they are matched against a series of five specimen sentences that are appropriate to the child's grade placement. Each specimen set represents a different quality of penmanship. The West Scale, developed in 1956-1957, uses two criteria for quality: speed and legibility. The Buzzi Scale developed in 1962 includes standards for manuscript letters for grades 1-3. The Herrick Scale was developed in 1963 and is a master scale which defines the whole continuum of writing quality. Further information and a critical review of legibility scales can be found in Herrick and Erlebacher (1963), Anderson (1968), and Starkel (1975). It is important if handwriting is of concern that some scale be used to increase the reliability of the judgment. Very few teachers have been trained to teach handwriting and instruction may vary from following an organized handwriting program to offering no instruction. Very seldom is there individual instruction in handwriting.

If it is determined via the analysis of the referral that the writing problem is in areas other than handwriting, then the use of standardized survey tests which measure aspects of written expression might be appropriate. However, Wallace and Larsen (1978) point out that the majority of the standardized survey tests cannot be used unless the students read at or near grade level. When selecting these types of instruments, the psychologist and the diagnostic team must be aware of what the subtests purport to measure, what they actually measure, and the technical adequacy of the entire test as well as its subtests. Detailed information concerning survey tests can be found in the various editions of the Mental Measurement Yearbooks. Table 1 provides cursory information about some of the popular survey tests that do assess components of written expression.

There are very few diagnostic tests of written language, but Table 2 does provide limited information regarding four diagnostic instruments which do assess written lanaguage. At this point in time, the TOWL is the most promising assessment measure for grades 3-8 and the TOAL assesses some components of written language for grades 6-12. It is apparent that informal assessment techniques must be used to add to the knowledge gained from the formal tests.

Informal Assessment

Informal tests/inventories and error pattern analysis will be discussed regarding their application to assessment of writing. The most important aspect of the informal assessment of written expression is the gathering of writing samples.

Diagnostic Tests/Inventories. One example of a thorough informal diagnostic test is the Diagnostic Evaluation of Writing Skills (DEWS) by Weiner (1980a). Weiner suggests asking the student to write an autobiography, allowing 30 minutes for writing and 15 minutes for revision. The DEWS contains 41 criteria for six categories of writing skills: (1) graphic - visual features; (2) orthographic - spelling; (3) phonologic - sound components; (4) syntactic - grammatical; (5) semantic - meaning; and (6) self-monitoring skills. Appendix IX contains a reprint of the DEWS criteria for assessment. Weiner (1980a) explains each criterion in detail and (1980b) has conducted a study which shows that children with language problems can be identified with the DEWS.

Poteet (1980) has also developed an informal technique for analyzing samples of student's written work. Appendix X contains a reprint of his checklist. The evaluator is to place a check mark in the columns that best describe the students achievement in the first three components of written expression: penmanship, spelling, and grammar. The TA column is for those skills or characteristics that are too advanced or not appropriate for consideration at this time. The A column is for those skills that are adequately used in the sample. The column labeled I is for those skills which need to be introduced to improve the quality of writing, and the last column, labeled R, is for those skills which need remediation or review. The evaluator fills in the blanks on the checklist for the fourth component, Ideation. Poteet (1980) suggests that after the student has completed the

*Table 1

Standardized Survey Tests that Measure
Elements of Written Expression

Instrument	Grade/age level	Norms**	Reliability	Validity	Skills Measured	Evaluators Comments
Basic School Skills Inventory	K-1	NR & CR	(did not have access to this information)	(did not have access to this information)	Handwriting	Assesses handwriting readiness. The tasks the child failed can be used as a guide for selecting goals and activities.
Brigance Diagnostic Inventories	Developmental level less than 7 years through secondary school age.	CR	None	Content	Fine motor sequences, handwriting sequences, grammar sequences, writing (letter formation, punctuation, letter writing).	Good for planning and evaluating content validity, good reliablity data should be obtained.
California Achievement Test (CAT) Written Expression	1-12	NR & CR	Internal consistency Test re-test on CR use.	Content cross-validation.	Mechanics= capitalization and punctuation skills. Expression= word usage, sentence structure, and paragraph organization.	Adequately standardized reliability and validity evidence good.

Instrument	Grade/age level	Norms**	Reliability	Validity	Skills Measured	Evaluators Comments
Iowa Test of Basic Skills ITBS (ITBS) Language	K-9	Yes	Internal consistency	Content criterion validity based on earlier forms of the test.	Capitalization, punctuation, usage.	Development and standardization of ITBS and TAP adequate.
Tests of Achievement and Proficiency (TAP) Written Expression	High school	Yes	Internal consistency	Same as ITBS	Writing organizing ideas, letters, themes, word usage, word order.	Need test/ re-test reliability.
Metropolitan Achievement Test (MAT) Language	K-12	NR & CR	Internal consistency	Content criterion related.	Punctuation and capitalization usage, grammar and syntax.	There are 2 sets of tests: Survey and Instructional materials contain detailed content outlines, objectives for each item, guidelines for interpretation Can use the Instructional Battery for Planning and Evaluation Technically.

Instrument	Grade/age level	Norms **	Reliability	Validity	Skills Measured	Evaluators Comments
Stanford Achievement Test (SAT) Language	3.5-9.5	Yes	Split-half estimates KR-20 Coefficients	Content criterion	Capitalization, punctuation usage. 4.5-9.5 includes dictionary skill.	Standardization reliability, and validity exceptionally good. Provides instructional objectives and suggestions for teaching objectives.
Stanford Test of Academic Skills (TASK) Language	9-12 High School Community College	Yes	Same as SAT	Same as SAT	Above skills plus sentence sensitivity and paragraph arrangement.	TASK upward extension of SAT.
Woodcock Johnson Psychoeducational Battery Dictation Proofing	3-80 Years	Yes	Split-half	Criterion	Punctuation, capitalization, usage, and spelling via dictation and via proofreading typewritten passages.	Adequately standardized data support reliability and validity. Information may have limited instructional relevance.

*This table was prepared from material by Salvia & Ysseldyke, 1981, and Wallace & Larsen, 1978; as well as from this authors experience with the instruments.

**NR=Norm Referenced
CR=Criteria Referenced

*Table 2

Diagnostic Tests of Written Language

Instrument	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Comments
Picture Story Language Test (PSLT)	7-17	Yes	Test/re-test split-half	The author says yes, but evidence not adequately presented in original material.	Students written story evaluated according to productivity, correctness, and meaning.	Recommended that the test be used only as an informal observation technique. Reliability and validity data not adequate.
Sequential Test of Educational Progress (STEP)	4-14	Yes	Split-half	Content limited information regarding any other type of validity.	Student must identify 5 categories of errors in written passages: organization, conventions, critical thinking, effectiveness, and appropriateness.	There is no direct analysis of a student's own writing, but the student must select appropriate revisions to correct identified errors. Error pattern analysis can be done. Recommend that the test be used in conjunction with samples of the students writing. There is some question

Instrument**	Grade/age level	Norms	Reliability	Validity	Skills Measured	Evaluators Comments
						regarding the quality of the material presented and the quality of the reliability and validity data.
Test of Adolescent Language (TOAL) Writing/Vocabulary Writing/ Grammar	6-12	Yes	Internal consistency (SEM reported) Test/re-test Scorer reliability	Content criterion-related construct	The student writes sentences using 24 vocabulary words. Correct usage scored. The student combines sentences into one sentence. Measures use of syntax.	To date there have been limited studies of the stability and validity of the test. The information the authors provide indicates technical adequacy but studies with much larger samples are needed.
Test of Written Language (TOWL)	3-8	Yes	Internal consistency Test re-test Interrater reliability.	Content criterion construct	Vocabulary, thematic maturity, thought units, handwriting, spelling, word usage, and style via student's writing sample or proofreading and dictation tasks.	There are some questions regarding item selection and the representativeness of the normative sample. The limitations of the test must be kept in mind when making decisions.

*This table was prepared from material by Salvia & Ysseldyke, 1981; Wallace & Larsen, 1978; and the test manuals and the Sixth and Seventh Mental Measurement Yearbooks.

writing task, he/she should read aloud what was written, and the evaluator should note any discrepancies between the oral and written sample. This will help the evaluator decipher misspelled and unrecognized errors. Following that, the evaluator should begin a careful and critical analysis of the written sample, using the checklist to check each component. Poteet (1980) provides a detailed explanation of each component and suggestions for analyzing the component.

Simple measures of written expression have been described and investigated (Deno, Marston, & Mirkin, 1982; Marston, Lowry, Deno, & Mirkin, 1981). Marston, et al. (1981) found that in a sample of students ranging in age from 6-4 to 12-3, simply looking at words written correctly and total words written were appropriate measures of growth over time. They found these measures to be more appropriate for younger students. Deno, et al. (1982) compared the results of six simple measures of written expression: (1) Mean T-Unit Length; (2) Mature Words; (3) Large Words; (4) Words Spelled Correctly; (5) Letter Sequences Correct; and (6) Total Words Written with nine different criterion variables taken from the TOWL, Stanford Achievement Test, and Developmental Sentence Scoring System. Total Words Written, Words Spelled Correctly, Correct Letter Sequence, and Mature Words most strongly and consistently related to the criteria used. The authors recommend that Total Words Written be used as a measure for students writing words on cue, while Counting Correct Letter Sequences might be more appropriate for beginning writers. The results of this study also revealed significant differences between students at different grade levels and in different programs (resource room vs. regular placement) in the areas of Total Words Written, Mature Words, Words Spelled Correctly, and Letters in Correct Sequence.

Humes (1980a) provides examples and explanations of some of the informal assessment techniques used by the Southwestern Regional Laboratory for Educational Research and Development (SWRL). These techniques could be adapted for use by the psychologist or classroom teachers as part of the diagnostic process. Appendix XI contains a specific example of a writing task and the scoring criteria for evaluating the writing sample. Appendices XII and XIII contain two more examples of informal assessment of writing skills. All of these techniques are currently being used in school districts and could be adapted for local use. Since some are copyrighted, they can only be used as models for developing new techniques unless permission to use them is obtained.

Observation is a necessary part of formal and informal assessment and it can also be considered as a separate technique. The reader is referred to the guidelines for observation in the mathematics and spelling sections of this paper as observation will not be discussed as a separate technique for written expression. Types of observation techniques such as checklists will be discussed under Error Pattern Analysis.

Error Pattern Analysis. The general guidelines for error pattern analysis are found in the section on Mathematics. As in the areas of mathematics and spelling, error pattern analysis is a major part of the diagnostic process for written expression. It can be used to analyze the various components of written expression such as handwriting, punctuation, capitalization, syntax, and ideation. Howell and Kaplan (1980) provide a recording form for analyzing a student's handwriting whether the

student is copying a written sample from near or far or writing something from memory (See Appendix XIV).

Hammill and Poplin (1978) report the ten most common errors in handwriting that Newland (1932) found when analyzing the cursive handwriting errors of 2,381 people.

1. Failure to close letters (e.g., a, b, f, etc.) accounted for 24 percent of all errors.

2. Top loops closed (l like t, e like i) accounted for 13 percent.

3. Looping nonlooped strokes (i like e) accounted for 12 percent.

4. Using straight up-strokes rather than rounded strokes (n like u, c, like i) accounted for 11 percent.

5. End-stroke difficulty (not brought up, not brought down, not left horizontal) accounted for 11 percent.

6. Top short (b, d, h, K): 6 percent.

7. Difficulty crossing t: 5 percent.

8. Letters too small: 4 percent.

9. Closing c, h, u, w: 4 percent.

10. Part of letter omitted: 4 percent (pp. 181, 184).

Hammill and Poplin (1978) suggest that Newland's (1932) information could easily be used for developing a simple criterion referenced assessment procedure. Either a specific sample of writing which includes the letters most likely to be illegible or the student's spontaneous work could be evaluated to determine how the student forms those specific letters. Appendix XV provides a chart for evaluating the letters.

Freeman's (1965) checklists can be used as a guide to error analysis also, and they are reprinted in Appendix XVI. Hadley (1977) suggests that penmanship/handwriting be evaluated according to these criteria for letter formation: (1) correctly shaped; (2) uniformly sized, (3) proper height; (4) position between line margins, (5) slanted in one direction; and (6) equally spaced.

Wallace and Larsen (1978) suggest that observation and error pattern analysis can be used to assess samples of a student's written work in the following areas: general composition, appropriate diction, master of capitalization and punctuation, and quality of handwriting. They provide a sample profile of components of written expression (Appendix XVII) and explanation of the components for evaluation.

1. purpose - main ideas unclear or missing, too broad, lacking in significance, or poorly stated.

2. content - ideas unsupported, lack specifics, unrelated to the subject, or taken from another source.

3. organization - introduction and conclusions poorly stated, ideas randomly presented, transitions inappropriately used.

4. paragraphs - paragraphs inadequately developed.

5. sentences - sentences are fragmented, consist of dangling modifiers, lack variety, show problems with tense, subject-verb agreement, and pronoun-antecedent agreement.

6. word choice and usage - vocabulary inappropriate, cliches, tone ineffective.

7. capitalization - incorrectly used in titles, proper nouns, words for deity, etc.

8. punctuation - italics, period, comma, exclamation point, quotes incorrectly used.

9. handwriting - does not permit quick and easy reading in either manuscript or cursive style (pp. 409, 411).

Wallace and Larsen (1978) also present a list of errors, proposed by Burns (1974), to be analyzed in word usage as well as a sample of an analysis chart (See Appendix XVIII). Wallace and Larsen (1978) suggest that the chart be modified to fit an evaluator's specific needs, but that word usage always be evaluated in some systematic way.

Furness (1960) has listed the seven most common errors in punctuation (Appendix XIX). These can be useful in making a quick assessment of a student's punctuation skills. Burns (1974) suggests that an evaluator dictate to a student a series of short sentences and paragraphs in which punctuation rules are used, and then analyze the written passage for errors. Wallace and Larsen (1978) recommend that a record of these errors be kept on a chart such as that reprinted in Appendix XX. They also suggest that analysis of capitalization errors can be facilitated by charting a student's errors (See Appendix XXI).

In order to analyze a student's difficulties in writing paragraphs, Wallace and Larsen (1978) suggest that the following questions be asked:

1. Does the paragraph deal with only one topic?

2. Are the major points of the paragraph presented in a correct sequence?

3. Does the paragraph have a beginning sentence that adequately introduces the idea to be discussed?

4. Does the paragraph have an end sentence that concludes the idea discussed?

5. Is each new paragraph started on a new line?

6. Is the first word of the paragraph indented?

7. Are there any run-on or fragmented sentences (p. 417)?

All of the above suggestions and examples for informal assessment can be adapted to meet the specific needs of the student. The information obtained during formal assessment should have provided the psychologist/diagnostician or the diagnostic team with enough information to individualize the informal assessment in order to pinpoint strengths and weaknesses and plan for instruction/ remediation.

Instruction/Remediation

More information is available regarding instruction in handwriting than in any other components of written expression. Westerman (1971) reports that teaching of handwriting is almost solely based on recommended practices in commercial systems and not on research based information. She states that the main goal in handwriting instruction is to enable every student to write as well as he/she can at a reasonable speed. The main issues regarding handwriting instruction are: (1) whether to teach it or not; (2) appropriate precursory activities; (3) proper handwriting movement; (4) measurement of handwriting quality; and (5) comparison of styles (manuscript vs. cursive) (Anderson, 1966; Howell & Kaplan, 1980; Starlin, 1982; & Westerman, 1971).

Starlin (1982) bases his suggestions for handwriting on the findings reported by Anderson (1966) and others, which indicate that there is no research data to support the use of a "beginner" pencil, widelined paper, or teaching manuscript then cursive writing. Thus, he suggests that instruction should begin where it is planned for it to end up. Precursors to handwriting skills would be visual-motor integration activities that work on reproducing letters rather than geometric shapes, etc.

Cicci (1980) suggests that remediation in handwriting center on structured and unstructured pre-writing activities for young children, and that for older children a decision must be made as to how efficient it is to work on handwriting vs. teaching a compensatory skill such as typing.

Hammill and Poplin (1978) review some of the remediation materials available for handwriting, and the programmed texts by Skinner and Krakower (1968) receive a good rating. These texts provide practice in actual writing and give immediate feedback to students.

Westerman (1971) suggests that in order to change the current practices in handwriting and provide more meaningful instruction. The following needs to be done:

1. Realize handwriting is a vital social and academic skill.

2. Make it part of the total language arts program.

3. Use objective diagnostic and evaluative scales to assess progress.

4. Provide for individual differences in motor readiness, letter content, practice time, and learning methods.

5. Keep up-to-date on current research regarding writing style and teaching methodology.

Hammill and Poplin (1978) provide suggestions for teaching the various components of written expression, and their chapter could be a useful resource when writing a student's individual instructional plan. Many of the scope and sequence charts and checklists used as aids for assessment can also be used to plan instruction. Starlin's (1982) approach to assessment is geared to providing practice in each of the problem areas.

Hadley (1977) suggests that expressive writing be encouraged via telling, reading, or listening to stories. It needs to be pointed out to the students that the stories all have beginnings, main characters, conclusions, etc. Listening to stories read by others has proven to be an effective technique for encouraging students with reading and writing difficulties to continue their efforts in these areas.

Cicci (1980) suggests that remediation of written formulation should focus on the free flow of ideas, emphasizing that it is talk written down. She feels that if the goal is for clear expression of ideas through writing, then correction for spelling and handwriting may have to wait. She and Westerman (1971) both advocate an integrated approach to written expression. She recommends integrating oral language expression with written output and providing practice activities such as combining simple sentences into complex one. She suggests the following modifications be made in the regular classroom:

1. Require some written work.

2. Permit oral examinations.

3. Accept taped rather than written reports.

4. Permit the student to dictate assigned compositions to his/her parents.

5. Permit parents to proofread for errors.

6. Reduce length of written assignments.

7. Give separate grades for content, grammatical structure, and spelling.

8. Be certain each teacher is aware of the impact of written language deficits on subject he/she teaches.

Relative to written formulation, ideation, or conceptual writing, there seem to be three major goals: (1) to teach the student the minimum competencies necessary to succeed in the school curriculum; (2) to instruct the students in those skills that will be required for success outside the school; and (3) to teach the student to express their ideas creatively in poetry, stories, etc. Decisions will have to be made as the fulfillment of those goals will not

be possible for all students. If one encounters an adolescent with significant problems in written expression, the emphasis in instruction/remediation should be on survival skills.

This brief overview of instructional/remedial activities simply provides an introduction to instruction. Since currently there is limited research supporting one method of instruction over another, the information obtained from assessment will have to be used as the core for designing individual intervention programs. Evaluating the effectiveness of intervention is one of the continuous steps in the diagnostic process.

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APPENDIX

Table 5–1. *Handwriting*

Materials: primary pencil
lined primary writing paper
crayons
drawing paper
card containing a common word

All the items on this subscale relate to the child's proficiency in using a pencil. For the most part, these abilities have to be taught by teachers or parents; it is unlikely that a child will master the pencil entirely through incidental experience. Children who do well on the subscale are likely to be ready for instruction in either manuscript or cursive writing.

22. *Does the child print from left to right?*
To earn a pass on this item, a pupil should evidence some consistent knowledge of left–right progression in writing. His letters or words may be illegible, poorly formed, misspelled, or otherwise inadequate and still be recorded as a pass if, in the execution of his written efforts, he proceeds in a left-to-right sequence. This sequence does not even have to be on a straight line; diagonal writing is permissible, as long as it is basically left to right.

23. *When printing, does the child exhibit an easy three-finger grasp near the tip of his pencil?*
For most pupils, writing is accomplished most easily when the pencil is grasped with the thumb and the next two fingers. Using either hand, the child should hold the pencil loosely near the pencil tip. Holding the pencil in the palm of the hand is a nonscorable grip.

24. *Can the child print his first name?*
The intention of this item is to determine whether the child can write (manu-

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script or cursive) his first name on command. The product does not have to be properly formed. The result must, however, be recognizable as being the child's actual name. Writing one's name from a model is not acceptable here.

25. *Does the child maintain a proper sitting and writing position?*
Observe whether the child keeps his head reasonably erect, uses the nonwriting hand to hold the paper in a steady position, etc.

26. *Can the child draw a triangle with three sharp angles and no openings?*
This is a copying task; therefore, avoid asking the child to "draw a triangle." Some children may execute the task on command, thus demonstrating both understanding of the term *triangle* and motor competence in drawing the figure. However, this task is designed to determine adequacy in pencil use, not language proficiency. Many children, who may not know the meaning of the word *triangle*, have the motor ability to draw the form correctly.

Show the child a model and ask him to draw the same shape. To earn a pass, the child's drawing must have three sharp angles and no openings. It may be constructed with one continuous line or with several lines.

27. *When given a common word on a card, can the child copy the word correctly on his own paper?*
Place a card containing a common word on the child's desk. The pupil must copy the example correctly to receive a plus for the item.

28. *Can the child draw a picture of a person with a recognizable head, body, arms, and legs?*
To pass this item, the child's drawing must include the four body parts indicated. Stick figures are permissible, provided the parts are definitely connected and recognizable. Eyes, nose, mouth, ears, neck, fingers, and other details are desirable but not necessary.

29. *When a common word is written on the chalkboard, can the child copy it correctly on his own paper?*
A child's ability to copy from the chalkboard requires his focusing on the work at the board, retaining the images of the letters, and transferring the images to his own paper. To earn a pass, the pupil must copy the word correctly.

30. *When printing, can the child stay on the line?*
This is a relatively difficult task for many children. In scoring the item, you are concerned with the child's skill at organizing and spacing his letters squarely on the line, not with the legibility or quality of the letters themselves.

31. *Can the child print his last name?*
To receive credit for this item, a child should make a solid attempt at writing his last name. The name may be misspelled and some of the letters may be reversed or poorly formed. The point here is that the child has enough of an idea about the written form of his name that he will attempt to write it.

Source: L. Goodman and D. D. Hammill. *The Basic School Skills Inventory* (Chicago: Follett, 1975). Reprinted

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Table 5–3. *Scope and Sequence of Conceptual Writing Skills*

	Grade 1	*Grade 2*	*Grade 3*
Capitalization	The first word of a sentence The child's first and last names The name of the teacher, school, town, street The word "I"	The date First and important words of titles of books the children read Proper names used in children's writings Titles of compositions Names of titles: Mr., Mrs., Miss	Proper names: month, day, common holidays First word in a line of verse First and important words in titles of books, stories, poems First word of salutation of informal note, as "Dear" First word of closing of informal note, as "Yours"
Punctuation	Period at the end of a sentence which tells something Period after numbers in any kind of list	Question mark at the close of a question Comma after salutation of a friendly note or letter Comma after closing of a friendly note or letter Comma between the day of the month and the year Comma between name of city and state	Period after abbreviations Period after an initial Use of an apostrophe in a common contraction such as isn't, aren't Commas in a list
Vocabulary	New words learned during experience Choosing words that describe accurately Choosing words that make you see, hear, feel	Words with similar meanings; with opposite meanings Alphabetical order	Extending discussion of words for precise meanings Using synonyms Distinguishing meanings and spellings of homonyms Using the prefix *un* and the suffix *less*
Word Usage	*Generally in oral expression* Naming yourself last Eliminating unnecessary words (my father he); use of *well* and *good* Verb forms in sentences: is, are did, done was, were see, saw, seen	*Generally in oral expression* Double negative Use of *a* and *an*; *may* and *can*; *teach* and *learn* Eliminating unnecessary words (this here) Verb forms in sentences: rode, ridden took, taken grow, grew, grown	Use of *there is* and *there are*; *any* and *no* Use of *let* and *leave*; *don't* and *doesn't*; *would have*, not *would of* Verb forms in sentences: throw, threw, thrown drive, drove, driven wrote, written tore, torn

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Grade 4	*Grade 5*	*Grades 6, 7, and 8*
Names of cities and states in general Names of organizations to which children belong, such as Boy Scouts, grade four, etc. Mother, Father, when used in place of the name Local geographical names	Names of streets Names of all places and persons, countries, oceans, etc. Capitalization used in outlining Titles when used with names, such as President Lincoln Commercial trade names	Names of the Deity and the Bible First word of a quoted sentence Proper adjectives, showing race, nationality, etc. Abbreviations of proper nouns and titles
Apostrophe to show possession Hyphen separating parts of a word divided at end of a line Period following a command Exclamation point at the end of a word or group of words that make an exclamation Comma setting off an appositive Colon after the salutation of a business letter Quotation marks before and after a direct quotation Comma between explanatory words and a quotation Period after outline Roman numeral	Colon in writing time Quotation marks around the title of a booklet, pamphlet, the chapter of a book, and the title of a poem or story Underlining the title of a book	Comma to set off nouns in direct address Hyphen in compound numbers Colon to set off a list Comma in sentences to aid in making meaning clear
Dividing words into syllables Using the accent mark Using exact words which appeal to the senses Using exact words in explanation Keeping individual lists of new words and meanings	Using antonyms Prefixes and suffixes; compound words Exactness in choice of words Dictionary work; definitions; syllables; pronunciation; macron; breve Contractions Rhyme and rhythm; words with sensory images Classification of words by parts of speech Roots and words related to them Adjectives, nouns, verbs—contrasting general and specific vocabulary	Extending meanings; writing with care in choice of words and phrases In writing and speaking, selecting words for accuracy Selecting words for effectiveness and appropriateness Selecting words for courtesy Editing a paragraph to improve a choice or words
Agreement of subject and verb Use of *she, he, I, we,* and *they* as subjects Use of *bring* and *take* Verb forms in sentences: blow, blew, blown drink, drank, drunk lie, lay, lain take, took, taken rise, rose, risen	Avoiding unnecessary pronouns (the boy he . . .) Linking verbs and predicate nominatives Conjugation of verbs, to note changes in tense, person, number Transitive and intransitive verbs Verb forms in sentences: am, was, been say, said, said	Homonyms: *its,* and *it's; their, there, they're; there's, theirs; whose, who's* Use of parallel structure for parallel ideas, as in outlines Verb forms in sentences: beat, beat, beaten learn, learned, learned leave, left, left lit, lit, lit

(continued)

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Table 5–3. *Scope and Sequence of Conceptual Writing Skills (continued)*

	Grade 1	*Grade 2*	*Grade 3*
Word Usages	ate, eaten went, gone came, come gave, given	know, knew, known bring, brought drew, drawn began, begun ran, run	chose, chosen climbed broke, broken wore, worn spoke, spoken sang, sung rang, rung catch, caught
Grammar	Not applicable	Not applicable	Nouns: recognition of singular, plural, and possessive Verbs: recognition

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Grade 4	Grade 5	Grades 6, 7, and 8
teach, taught, taught raise, raise, raise lay, laid, laid fly, flew, flown set, set, set swim, swam, swum freeze, froze, frozen steal, stole, stolen	fall, fell, fallen dive, dived, dived burst, burst, burst buy, bought, bought Additional verb forms: *climb, like, play, read, sail, vote, work*	forgot, forgotten swing, swung, swung spring, sprang, sprung shrink, shrank, shrunk slid, slid, slid
Nouns, common and proper; noun in complete subjects Verb in complete predicate Adjectives: recognition Adverbs: recognition (telling how, when, where) Adverbs modifying verbs, adjectives, other adverbs Pronouns: recognition of singular and plural	Noun: possessive; objective of preposition; predicate noun Verb: tense; agreement with subject; verbs of action and state of being Adjective: comparison; predicate adjective; proper adjective Adverb: comparison; words telling how, when, where, how much; modifying verbs, adjectives, adverbs Pronouns: possessive; objective after prepositions Prepositions: recognition; prepositional phrases Conjunction: recognition Interjection: recognition	Noun: clauses; common and proper nouns; indirect object Verb: conjugating to note changes in person, number, tense; linking verbs with predicate nominatives Adjective: chart of uses; clauses; demonstrative; descriptive, numerals; phrases Adverb: chart of uses; clauses; comparison; descriptive; ly ending; modification of adverbs; phrases Pronoun: antecedents; declension chart—person, gender, case; demonstrative; indefinite; interrogative; personal; relative Preposition: phrases Conjunction: in compound subjects and predicates; in subordinate and coordinate clauses Interjection: placement of, in quotations Noun: antecedent of pronouns; collective nouns; compound subject; direct object; indirect object; object of preposition Verb: active and passive voice; emphatic forms; transitive and intransitive; tenses; linking verbs Adverb: as modifiers; clauses; comparing adverbs; adverbial phrase, use of *well* and *good* Adjectives: as modifiers; clauses; compound adjectives Pronouns: agreement with antecedents; personal pronoun chart; indirect object; object of preposition; objective case, person and number; possessive form Preposition: in phrase Conjunction: coordinate; subordinate; use in compound subjects; compound predicates; complex and compound sentences

(continued)

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	Grade 1	*Grade 2*	*Grade 3*
Sentences	Write simple sentences	Recognition of sentences; kinds: statement and question Composing correct and interesting original sentences Avoiding running sentences together with *and*	Exclamatory sentences Use of a variety of sentences Combining short, choppy sentences into longer ones Using interesting beginning and ending sentences Avoiding run-on sentences (no punctuation) Learning to proofread one's own and others' sentences
Paragraphs	Not applicable	Not applicable	Keeping to one idea Keeping sentences in order; sequence of ideas Finding and deleting sentences that do not belong Indenting

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Grade 4	*Grade 5*	*Grades 6, 7, and 8*
Command sentences Complete and simple subject; complete and simple predicate Adjectives and adverbs recognized; pronouns introduced Avoiding fragments of sentences (incomplete) and the comma fault (a comma where a period belongs) Improving sentences in a paragraph	Using a variety of interesting sentences: declarative; interrogative; exclamatory; and imperative (you the subject) Agreement of subject and verb; changes in pronoun forms Compound subjects and compound predicates Composing paragraphs with clearly stated ideas	Development of concise statements (avoiding wordiness or unnecessary repetition) Indirect object and predicate nominative Complex sentences Clear thinking and expression (avoiding vagueness and omissions)
Selecting main topic Choosing title to express main idea Making simple outline with main idea Developing an interesting paragraph	Improvement in writing a paragraph of several sentences Selecting subheads as well as main topic for outline Courtesy and appropriateness in all communications Recognizing topic sentences Keeping to the topic as expressed in title and topic sentence Use of more than one paragraph Developing a four-point outline Writing paragraphs from outline New paragraphs for new speakers in written conversation Keeping list of books (authors and titles) used for reference	Analyzing a paragraph to note method of development Developing a paragraph in different ways: e.g., with details, reasons, examples, or comparisons Checking for accurate statements Use of a fresh or original approach in expressing ideas Use of transition words to connect ideas Use of topic sentences in developing paragraphs Improvement in complete composition—introduction, development, conclusion Checking for good reasoning Use of bibliography in report based on several sources

Source: Adapted from W. Otto and R. McMenemy, *Corrective and Remedial Teaching* (Boston: Houghton Mifflin, 1966); H. Greene and W. Petty, *Developing Language Skills in the Elementary School* (Boston: Allyn and Bacon, 1967).

Hammill, D.D., & Poplin, M. Problems in writing. In D.D. Hammill & N.R. Bartel (Eds.) Teaching Children With Learning and Behavior Problems. 2nd edition. Boston: Allyn and Bacon, 1978.

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TABLE 11-1 Minimal Skills Necessary for Successful Written Expression

	Grade Levels					
	1	2	3	4	5	6
Logical Sequence and Demonstration of Relationships						
1. Establish a controlled purpose for composition to determine the relevancy of ideas under consideration	X	X	X	X	X	X
2. Arrange ideas according to						
a. Order of importance	X	X	X	X	X	X
b. Spatial order	X	X	X	X	X	X
c. Time sequence	X	X	X	X	X	X
d. Cause and effect	X	X	X	X	X	X
3. Draw a simple comparison or contrast between two objects	X	X	X	X	X	X
4. Draw a simple comparison or contrast between two ideas		X	X	X	X	X
5. Understand and demonstrate relationships between valid evidence and generalization				X	X	X
6. Write in informal or formal style according to need		X	X	X	X	X
7. Be aware of steps of the composition process as a means of ordering thoughts		X	X	X	X	X
8. Recognize and produce						
a. Narrative prose		X	X	X	X	X
b. Descriptive prose		X	X	X	X	X
c. Expository prose			X	X	X	X
d. Argumentative prose					X	X
e. Poetry		X	X	X	X	X
Conventions of Written Expression						
1. Produce legible markings in						
a. Manuscript writing	X	X	X			
b. Cursive writing				X	X	X
2. Recognize and produce						
a. Correct punctuation	X	X	X	X	X	X
b. Correct capitalization	X	X	X	X	X	X
3. Be aware of appropriate format for different types of written composition (business letter, friendly note, report, etc.)	X	X	X	X	X	X
4. Draw conclusions regarding the adequacy of written composition by proofreading	X	X	X	X	X	X

Source: Adapted from the *Elementary composition curriculum guide*, 1967. Clover Park School District No. 400, 5214 Steilacoom Blvd., Lakewood Center, Wash. 98499.

In Wallace, G. & Larsen, S.C. Educational assessment of learning problems: Testing for teaching, Boston: Allyn and Bacon, 1978

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TABLE 11-2 Goals of Handwriting Instruction in Grades 1-6

Kindergarten and First Grade

1. Children exhibit familiarity (both through discussion and frequency of use) with writing as a form of communcation. This suggests that the teacher will use labels, charts, and stories dictated by children to accompany pictures.
2. Children learn to write their names and usually master the basic shapes used in writing. Many will be able to write short notes, stories, invitations, holiday greetings, etc., and most will be able at least to copy these from the chalkboard.
3. At the conclusion of the first grade most children master the alphabet, (upper and lower case letters).
4. Most children correctly write numbers to 10.

Second and Third Grades

1. A majority of children achieve mastery of the alphabet to the extent that they can write original stories, reports, etc. By the end of second grade handwriting is truly functional for most students.
2. Children are more skillful in spacing words and letters. Writing tends to be neater, more legible, and attractive.
3. Transition to cursive writing is made in second or third grade. Certain elements of joining letters, introduction of slant, etc., are taught to an entire class while individualized approaches are used for individual children when needed.
4. Although children make the transition from manuscript to cursive writing, basic skills in manuscript writing are maintained. Many children continue to use the manuscript form for independent writing activities because of its speed and ease.
5. Children learn the rudiments of punctuation, paragraph sense, format, etc.
6. In the third grade, pens are introduced as writing instruments.

Fourth, Fifth, and Sixth Grades

1. Children continually achieve mastery of cursive writing and establishing individual writing styles.
2. Manuscript writing is maintained for labeling, map work, and charts. All children are encouraged to retain this skill throughout elementary school.
3. Children acquire the objectivity necessary for evaluation of their own handwriting. Increased emphasis is placed upon self-help and individual responsibility for handwriting improvement in the intermediate and upper grades. Proofreading receives continuing emphasis through the sixth grade.
4. Functional competency is achieved in fields related to handwriting such as punctuation, paragraphing, identification and placement of topic sentences, etc.
5. Pens (ballpoints) are used with as much ease and fluency as pencils. Fountain pens also may be used if desirable.

Source: Adapted from Lamb, P. *Guiding children's language learning* © 1971, pp. 212-214. Reprinted by permission of William C. Brown Company, Publishers, Dubuque, Iowa. In Wallace, G. & Larsen, S.C. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

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Capitalization Skills

Grade One
- a. The first word of a sentence
- b. The child's first and last name
- c. The name of the teacher, school, town, street
- d. the word "I"

Grade Two
- a. Items listed for Grade one
- b. The date
- c. First and important words of titles of books the children read
- d. Proper names used in children's writings
- e. Titles of compositions
- f. Names of titles: "Mr.," "Mrs.," "Ms.," "Miss"

Grade Three
- a. Items listed for Grades one and two
- b. Proper names: month, day, common holiday
- c. First and important words in titles of books, stories, poems
- d. First word of salutation of informal note, as "Dear"
- e. First word of closing of informal note, as "Yours"

Grade Four
- a. All that is listed in preceding grades
- b. Names of cities and states in general
- c. Names of organizations to which children belong, as Boy Scouts, Grade Four, etc.
- d. Mother, Father, when used in place of the name
- e. Local geographical names

Grade Five
- a. All that is outlined for previous grades
- b. Names of streets
- c. Names of all places and persons, countries, oceans, etc.
- d. Capitalization used in outlining
- e. Titles when used with names, such as President Lincoln
- f. Commercial trade names

Grade Six
- a. All that is outlined for preceding grades
- b. Names of the Deity and the Bible
- c. First word of a quoted sentence
- d. Proper adjectives, showing race, nationality, etc.
- e. Abbreviations of proper names and titles

Source: Wallace, G. & Larsen, S.C. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon 1978.

Punctuation Skills

Grade One
- a. Period at the end of a sentence which tells something
- b. Period after numbers in any kind of list

Grade Two
- a. Items listed for Grade one
- b. Question mark at the close of a question
- c. Comma after salutation of a friendly note or letter
- d. Comma after closing of a friendly note or letter
- e. Comma between the day of the month and the year
- f. Comma between name of city and state

Grade Three
- a. Items listed for Grades one and two
- b. Periods after abbreviations
- c. Period after an initial
- d. Use of an apostrophe in common contraction, such as isn't, aren't, don't
- e. Commas in a list

Grade Four
- a. All items listed for previous grades
- b. Apostrophe to show possession
- c. Hyphen separating parts of a word divided at end of a line
- d. Period following a command
- e. Exclamation point at the end of a word or group of words that makes an exclamation
- f. Comma setting off an appositive
- g. Colon after the salutation of a business letter
- h. Quotation marks before and after a direct quotation
- i. Comma between explanatory words and a quotation
- j. Period after outline Roman numeral

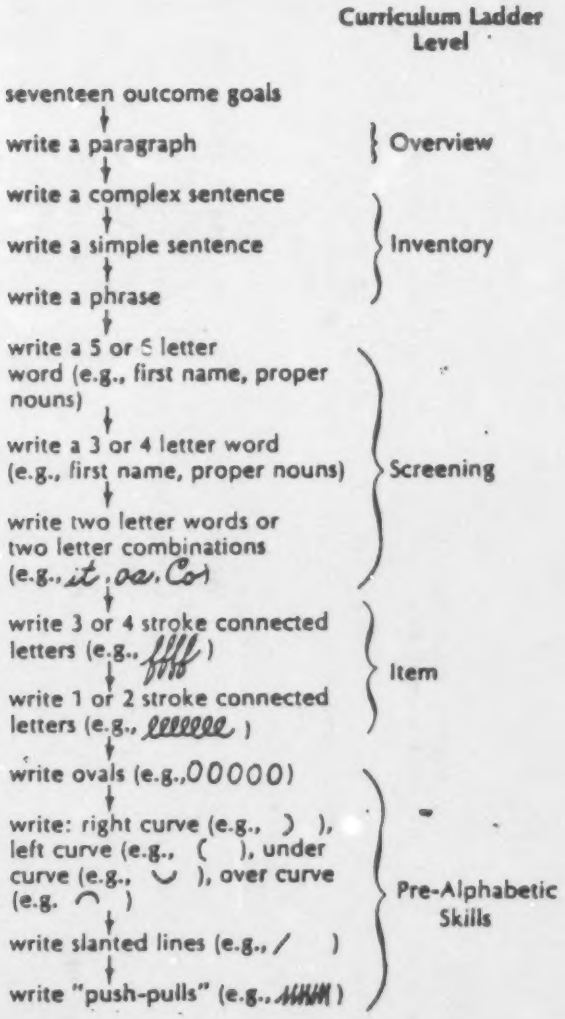
Grade Five
- a. All items listed for previous grades
- b. Colon in writing time
- c. Comma to indicate changed word order
- d. Quotation marks around the title of a pamphlet, chapter of a book, and the title of a poem or story
- e. Underlining the title of a book

Grade Six
- a. All items listed for previous grades
- b. Comma to set off nouns in direct address
- c. Hyphen in compound numbers
- d. Colon to set off a list
- e. Comma in sentences to aid in making meaning clear

---

[1]From Greene, H. A. and Petty, W. T. *Developing language skills in the elementary school*, Fifth Edition. Boston: Allyn and Bacon, Inc. 1975. In Wallace, G. & Larsen, S.C. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

Slicing - Handwriting Skills


Curriculum Ladder Level
seventeen outcome goals
write a paragraph
Overview
write a complex sentence
write a simple sentence
write a phrase
Inventory
write a 5 or 6 letter word (e.g., first name, proper nouns)
write a 3 or 4 letter word (e.g., first name, proper nouns)
write two letter words or two letter combinations (e.g., it, oa, Co)
Screening
write 3 or 4 stroke connected letters (e.g., fffff)
write 1 or 2 stroke connected letters (e.g., lllllll)
Item
write ovals (e.g., 00000)
write: right curve (e.g.,)), left curve (e.g., ( ), under curve (e.g., ∪), over curve (e.g. ∩)
write slanted lines (e.g., /)
write "push-pulls" (e.g., MMMM)
Pre-Alphabetic Skills

Source: Starlin, C.M. Iowa monograph: On reading and writing. Des Moines, Iowa: State of Iowa Department of Public Instruction 1982.

APPENDIX VIII

TABLE I

COMPARISON OF ALTERNATIVES

	Holistic	Analytical	Primary Trait
GOAL	Overall Impression	Trait-by-trait Analysis	Situation Specific Analysis
PREPARATION	Allow 1/2 day to find range finders; 1/2 day to train readers	1 day to I.D. traits 1 day per trait to dev. criteria 1 day to refine scoring 1/2 day to train readers	Same as analytical
SCORING TIME	1 to 2 min. per paper depending on length	1 to 2 min. per trait per paper	1 to 2 min. per trait per paper
CONTEXT	Contexts where rank order is useful	Contexts where skill analysis is useful	Contexts where skill analysis is useful

Source: Anderson, B.L. Writing assessment alternatives for the 80's, July, 1980. ED 192359.

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APPENDIX IX

TABLE 1. Diagnostic Evaluation of Writing Skills (DEWS): Criteria for assessment.

Graphic (visual features)	Examples of errors
1. Excessive pencil pressure marks	
2. Letter formation ambiguities; erasures	
3. Capital and lowercase letter mixture	
4. Size or spacing irregularities	
5. Off-line writing	
6. Margin slant or crowding	

Orthographic (spelling)	Examples of errors
7. Sequencing of letters (reverse order) or three consonant clusters	
8. Doubling final consonant	
9. ed ending with sound of d or t	
10. Prefix or suffix generalizations	
11. ie becomes ei after c and with sound of a	
12. y becomes i, except before ing	
13. c or g, followed by e, i, or y	
14. ch=k and sh; sh=si, ti, ci, ce, su	
15. ph and gh = f	
16. Silent letters in special spellings	
17. Schwa sounds; related words	
18. Word division by syllable	

Phonologic (sound components)	Examples of errors
19. Nonphonetic spelling (bizarre)	
20. Strictly phonetic spelling	
21. Letter or syllable omissions	
22. Words run together	

Syntactic (grammatical)	Examples of errors
23. Subject and predicate agreement	
24. Tense, plural, possessive endings	
25. Word order; omissions	
26. Incomplete sentences (fragments)	
27. Run-on sentences	
28. Punctuation; indentation of paragraphs	
29. Variety in sentence structure	
30. Coordination (and/but)	
31. Complex sentences: subordination	
32. Amount of information per sentance	

Semantic (meaning)	Examples of errors
33. Flexible vocabulary, connotative-denotative	
34. Coherence; focus and tense shifts	
35. Logical sequencing	
36. Transitions	
37. Distinction between major and minor points	
38. Inferential thinking; cause-effect	
39. Idiomatic and figurative language	

Self-Monitoring skills	Examples of errors
40. Self-correction: spelling and punctuation	
41. Improvement through revision	

Source: Weiner, E.S. Diagnostic evaluation of writing skills. Journal of Learning Disabilities

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Figure 1

CHECKLIST OF WRITTEN EXPRESSION*

Student's Name_____Grade Placement_____Teacher_____Grade_____

I. PENMANSHIP	TA	A	I	R	Notes
Rating: 1 2 3 4 5					
A. Spacing on the page					
B. Spacing of the sentences					
C. Spacing of the words					
D. Spacing of letters					
E. Slant					
F. Letter formations					
G. Pressure on the paper					
H. Pencil grip					
II. SPELLING					
_____% misspelled					
A. Miscalled rule					
B. Letter insertion					
C. Letter omission					
D. Letter substitution					
E. Phonetic spelling					
F. Directional confusion					
G. Schwa or r-controlled vowels					
H. Letter orientation					
I. Sequence					
J. Other					

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Figure 1
CHECKLIST OF WRITTEN EXPRESSION (Continued)

III. GRAMMAR	TA	A	I	R	Notes
A. *Capitalization*					
1. proper noun					
2. proper adjective					
3. first word in a sentence					
4. first word in a line of verse					
5. first word in a quotation					
6. principal words in a title					
7. personal title					
8. use of "I" or "O"					
9. personification					
10. salutation in a letter					
11. complimentary close in a letter					
12. other					
B. *Punctuation*					
1. period					
2. comma					
3. apostrophe					
4. quotation marks					
5. question mark					
6. semicolon					
7. exclamation mark					
8. colon					
9. the dash					
10. parentheses					
11. brackets					
12. the slash					
C. *Syntax*					
1. parts of speech					
a. verbs					
b. nouns					
c. pronouns					
d. adjectives					
e. adverbs					
f. prepositions					
g. conjunctions					
h. interjections					
2. agreement					
3. case					
4. pronoun reference					
5. order/position of words					
6. parallelism					
7. abbreviations/numbers					
8. the paragraph					

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Figure 1
CHECKLIST OF WRITTEN EXPRESSION (Continued)

IV. IDEATION

A. *Type of writing*
1. story_____ 2. poem_____ 3. letter_____ 4. report_____ 5. review_____

B. *Substance*
1. Naming_____ 2. Description_____ 3. Plot_____ 4. Issue_____

C. *Productivity*
1. Number of words written_____ 2. Acceptable number_____ 3. Too few_____

D. *Comprehensibility*
Easy to understand_____ Difficult to understand_____ Cannot understand_____
____perseveration of words ____illogical
____perseveration of ideas ____disorganized

E. *Reality*
_____Accurate perception of stimulus or task
_____Inaccurate perception of stimulus or task

F. *Style*
1. Sentence Sense
a. Completeness Tallies:
(1). complete sentences _____
(2). run-on sentences _____
(3). sentence fragments _____
b. Structure
(1). simple _____
(2). compound _____
(3). complex _____
(4). compound/complex _____
c. Types
(1). declarative _____
(2). interrogative _____
(3). imperative _____
(4). exclamatory _____

2. Tone
a. intimate_____ b. friendly_____ c. impersonal_____

3. Word Choice (N = none, F = few, S = some, M = many)
a. formality
formal_____ informal_____ colloquial_____
b. complexity
simple_____ multisyllable_____ contractions_____
c. descriptiveness
vague_____ vivid_____ figures of speech_____
d. appropriateness
inexact words_____ superfluous/repetitions_____ omissions_____

*Adapted from *The Inventory of Written Expression and Spelling* (Poteet, 1980).

Source: Poteet, J.A. Informal assessment of written expression. Learning Disability Quarterly. 1980, 3, 88-98.

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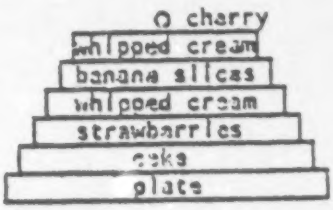
Directions: Read the contents and study the layers of the Fruit and Whipped Cream Treat.

Fruit and Whipped Cream Treat

Contents

1 yellow cake
1 cup of strawberries
1 cup of cut-up bananas
2 cups of whipped cream
1 cherry

Specifications for picture to be drawn:



Write a paragraph that explains to someone who has never fixed food how to put the Fruit and Whipped Cream Treat together.

- Start with the first thing you do.
- Tell about each part of the Treat that you put together.
- Tell about the parts in the order that you must put them together.
- Be sure to use exact words.
- Use words like next to join some of the sentences in your paragraph.

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Scoring Criteria	Good	Acceptable	Unacceptable
CONTENT:			
Includes all parts of the Treat.	___	___	___
Writes about the steps in the order in which they are performed.	___	___	___
Uses precise language.	___	___	___
Uses logical transitions.	___	___	___
Uses sentences that pertain to the main idea.	___	___	___
FORM:			
Uses correct grammar.	___	___	___
Uses good santence structure.	___	___	___
Capitalizes correctly.	___	___	___
Punctuates correctly.	___	___	___
Spells correctly.	___	___	___
Writes legibly, with appropriate margins and indentation.	___	___	___

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Sample of Scoring Guidelines

Includes all parts of the Treat (i.e., plate, cake, strawberries, whipped cream, banana slices, whipped cream, cherry).

Good: All parts are included.

Acceptable: Most parts are included.

Unacceptable: Many parts are missing.

Writes about the steps in the order in which they are performed (i.e., cake on plate, strawberries on cake, whipped cream on strawberries, banana slices on whipped cream, whipped cream on banana slices, cherry on whipped cream/cherry on top).

Good: Most or all steps are in the right order.

Acceptable: Many steps are in the right order.

Unacceptable: Many steps are not in the right order.

Comment: If fewer than three steps are included, do not score this criterion.

Uses precise language.

Good: Precise words are generally used to explain the procedure; e.g., an exact word like "spread" is used to explain adding a food part to the top of a previous food part.

Acceptable: General words are used to explain the procedure; e.g., "put on" is used to explain adding a food part to the top of a previous food part.

Unacceptable: Language used does not convey a sense of the procedure.

Uses logical transitions.

Good: Several logical transitions for time (e.g., "then," "next"), space (e.g., "on top of"), and possibly reason (e.g., "because") are used.

Acceptable: Few logical transitions are used.

Unacceptable: No logical transitions are used.

Source: Humes, A. A method for evaluating writing samples. Technical note Los Alamitos, California: Southwest Regional Laboratory for Educational Research and Development. April, 1980 a.

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APPENDIX XII

SCORING GUIDE

CONTENT: Students are to describe the pictured animals and write a story about the picture. They are to include a strange or funny event, write a "good ending," and give the story a title.

1. WRITES A TITLE.

    3. The title is appropriate and original.

    2. The title is appropriate, but unimaginative (for example, "The Race," or "The Animals").

    1. The title is not relevant to the story or is not included.

2. DESCRIBES CHARACTERS.

    3. Both characters are included and their physical appearances are described.

    2. Both characters are included, but the only descriptors included are the animals' names or types.

    1. One or no characters are included.

3. WRITES A STORY LINE THAT IS APPROPRIATE FOR THE PICTURE. [For example, the animals start the race; an event occurs that affects the animals or the race; a resolution concludes the race.]

    3. The story line is interesting and appropriate for the picture, and the events are appropriately sequenced.

    2. The story line lacks interest, but is appropriate, and most events are appropriately sequenced.

    1. The story line is not appropriate, and/or the events are sequenced so that the story is difficult or impossible to understand.

4. INCLUDES AN APPROPRIATE CONCLUSION.

    3. A significant and interesting conclusion is included, and it fits the story line.

    2. A conclusion is included, but it is not significant.

    1. A conclusion is not included or it is not appropriate.

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CONTENT: (continued)

5. SHOWS CREATIVITY AND ORIGINALITY

3. Color, style, and/or content distinguish the story from other students' stories.

2. The story is similar to other students' stories.

FORM: The form skills described below are important to written composition. Scoring guidelines for these skills are not precisely defined by numerical counts or values. Rather, they are dependent upon teacher judgment. Utilizing teacher judgment rather than exact numerical criteria expedites the handscoring process and gives accurate relative scores.

6. INDENTS FIRST WORD OF PARAGRAPH.

3. The first word is indented.

1. The first word is not indented.

7. CAPITALIZES FIRST WORD OF SENTENCES. [Sentences here include fragments that students perceive as sentences.]

3. All or most sentences have a capital letter for the first word.

2. Some sentences have a capital letter for the first word.

1. Many or all sentences do not have a capital letter for the first word.

8. INCLUDES PERIODS AT THE ENDS OF SENTENCES. [Sentences here include fragments that students perceive as sentences.]

3. All or most sentences end with periods or with other appropriate terminal punctuation.

2. Some sentences end with periods or with other appropriate punctuation.

1. Many or all sentences do not end with periods or other appropriate punctuation.

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9. SPELLS CORRECTLY.

3. All or most words are spelled correctly.

2. Several words are misspelled.

1. Only a few words are spelled correctly.

Comment: Many misspellings of the same word should be evaluated as one misspelled word.

10. WRITES LEGIBLY.

3. All or most words are readable and have appropriate size, shape, spacing, and alignment.

2. Many words are readable, and unreadable words do not interfere with comprehension of content.

1. Many words are unreadable so that content is difficult or impossible to read.

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SCORING KEY

		3	2	1
CONTENT				
1.	Writes a title.	_____	_____	_____
2.	Describes characters.	_____	_____	_____
3.	Writes a story line that is appropriate for the picture.	_____	_____	_____
4.	Includes an appropriate conclusion.	_____	_____	_____
5.	Shows creativity and originality.	_____	_____	
FORM				
6.	Indents first word of paragraph.	_____		_____
7.	Capitalizes first word of sentences.	_____	_____	_____
8.	Includes periods at the ends of sentences.	_____	_____	_____
9.	Spells correctly.	_____	_____	_____
10.	Writes legibly.	_____	_____	_____

Source: Cronnell, B. The scoring of writing samples: A study. Los Alamitos, California: Southwest Regional Laboratory for Educational Research and Development. November, 1980. ED 199758.

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APPENDIX XIII

GRADE 6 WRITING SAMPLE*

PROMPT

Writ a letter to a friend. The purpose of the letter is to convince your friend to watch your favorite television program.

- Tell your friend that you think he or she should watch the program.
- Give the name of the program.
- Tell how the program makes you feel when you watch it. Use exact words that describe your feelings.
- Give two more good reasons why your friend should watch the program.
- Include all parts of a personal letter and put each of them in the right place on the page.
- Use good grammar and language.
- Write complete sentences.

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SCORING GUIDE

CONTENT: Students are to write a letter to a friend to convince that friend to watch their favorite television program. They are to state their opinion of the named program, describe how the program makes them feel, and give two more reasons why the friend should watch it.

1. STATES A POINT OF VIEW.

    3. A point of view is stated. (For example, the student says he/she thinks the friend should watch a specific television program.)

    2. A statement of fact is given. (For example, the student says he/she watches a specific television program.)

    1. Neither point of view nor statement of fact is included.

2. DESCRIBES FEELINGS IN SPECIFIC WORDS. [For example, specific words like "happy" rather than general words like "good" describe feelings.]

    3. Feelings are described in specific terms.

    2. Feelings are described in general terms.

    1. Feelings are not described.

3. INCLUDES REASONS TO SUPPORT OPINION [that friend should watch program].

    3. Two or more reasons are included.

    2. One reason is included.

    1. No reasons are included.

4. INCLUDES CONTENT CONVENTIONS APPROPRIATE FOR A PERSONAL LETTER [For example, begins and ends with audience amenities such as saying "I hope to hear from you soon" so that the composition reads like a letter rather than like an essay; uses the pronouns I/me and you.]

    3. The content suggests a personal letter.

    2. Only part of the content suggests a personal letter.

    1. The content does not suggest a letter at all.

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CONTENT: (continued)

5. SHOWS CREATIVITY AND ORIGINALITY.

    3. Color, style, content distinguish the letter from other students' letters.

    2. The letter is similar to other students' letters.

FORMAT: Students are to use the correct format for writing a personal letter.

6. INCLUDES ALL PARTS OF A PERSONAL LETTERS. [Date, greeting, body, complimentary closing, signature; the sender's address may also be included above the date; for scoring this criterion, proper placement is ignored--see number 7.]

    3. All or nearly all parts of the personal-letter format are included.

    2. Some parts of the personal-letter format are included.

    1. Few or no parts of the personal-letter format are included.

7. PLACES LETTER PARTS CORRECTLY ON THE PAGE [see parts above].

    3. All or nearly all letter parts are correctly placed.

    2. Some letter parts are correctly placed.

    1. Few or no letter parts are correctly placed. [This criterion is also scored if no parts are included.]

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FORM: The form skills described below are important to the writing product. Scoring guidelines for these skills are not precisely defined by numerical counts or values. Rather, they are dependent upon teacher judgment. Utilizing teacher judgment rather than exact numerical criteria expedites the handscoring process and gives accurate relative scores.

8. USES COMPLETE SENTENCES.

   3. All or most sentences are complete.

   2. Some sentences are complete.

   1. Most sentences are fragments and/or run-ons.

9. USES CORRECT GRAMMAR [for example, subject-verb agreement, pronoun form].

   3. The letter has few or no grammatical errors.

   2. The letter has some errors in grammar.

   1. The letter has many errors in grammar.

10. CAPITALIZES AND PUNCTUATES CORRECTLY.

   3. The letter has few or no errors in capitalization and punctuation.

   2. The letter has some errors in capitalization and punctuation.

   1. The letter has many errors in capitalization and punctuation.

11. SPELLS CORRECTLY.

   3. Most or all words are correctly spelled.

   2. Several words are misspelled.

   1. Many words are misspelled.

      Comment: Many misspellings of the same word should be evaluated as one misspelled word.

12. WRITES LEGIBLY AND INDENTS PARAGRAPHS [cursive writing, with appropriate size, shape, slant, spacing, alignment; paragraph indentation].

   3. The letter has few or no exceptions to the criterion.

   2. The letter has some exceptions to the criterion.

   1. The letter has many exceptions to the criterion.

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SCORING KEY

	3	2	1
CONTENT			
1. States a point of view.	_____	_____	_____
2. Describes feelings in specific words.	_____	_____	_____
3. Includes reasons to support opinion.	_____	_____	_____
4. Includes content conventions appropriate for a personal letter.	_____	_____	_____
5. Shows creativity and originality.	_____	_____	
FORMAT			
6. Includes all parts of a personal letter.	_____	_____	_____
7. Places letter parts correctly on the page.	_____	_____	_____
FORM			
8. Uses complete sentences.	_____	_____	_____
9. Uses correct grammar.	_____	_____	_____
10. Capitalizes and punctuates correctly.	_____	_____	_____
11. Spells correctly.	_____	_____	_____
12. Writes legibly and indents paragraphs.	_____	_____	_____

Source: Cronnell, B. The scoring of writing samples: A study. Los Alamitos, California: Southwest Regional Laboratory for Educational Research and Development. November, 1980.

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APPENDIX XIV

Student_____ Grade____ Evaluator_____ Date_____

Task_____

POWER/TIMED COPY (NEAR/FAR)/MEMORY TOTAL NO. OF SYMBOLS____

ALIGNMENT	SIZE	SPACING	LETTER FORMATION		ORIENTATION	ADDITION	SUBSTITUTION

FIGURE 6.2 *Handwriting recording form (error analysis)*

Source: Howell, K.W. & Kaplan, J.S. Diagnosing basic skills. A handbook for deciding what to teach. Columbus, Ohio: Charles F. Merrill, 1980.

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Fifteen Handwriting Demons

	Wrong	Right
1. *a* like *o*		
2. *a* like *u*		
3. *a* like *ci*		
4. *b* like *li*		
5. *d* like *cl*		
6. *e* closed		
7. *h* like *li*		
8. *i* like *e* with no dot		
9. *m* like *w*		
10. *n* like *u*		
11. *o* like *a*		
12. *r* like *i*		
13. *r* like *n*		
14. *t* like *l*		
15. *t* with cross above		

Source: Hammill, D.D. & Poplin, M. Problems in writing. In D.D.Hammill & N.R. Bartel (Eds.) Teaching children with learning and behavior problems, 2nd edition. Boston. Allyn and Bacon, 1978.

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Table 5–2. *Helping in Analyzing and Grading Handwriting*

Name *Manuscript Handwriting Grading Slip*

Your Manuscript Handwriting has been thoughtfully analyzed and rated according to the chart below. Any item checked in Section I is outstandingly good and worthy of mention. If an item in Section II is checked, it is faulty and needs improvement. To improve your manuscript handwriting, you will want to study both lists and then review the lesson giving special attention to all items checked—the good ones, to be continued; the faulty ones, to be corrected.

Section I Good

- ☐ Appearance of work
- ☐ Size
- ☐ Quality of line
- ☐ Vertical writing
- ☐ Form of letters
- ☐ Spacing
- ☐ Alignment
- ☐ Proportion
- ☐ Figures
- ☐ Margins

Section II Room for Improvement

Position of Hand, Arm, Body, or Paper
- ☐ Incorrect

Size of Writing
- ☐ Too large
- ☐ Too small
- ☐ Varying in size
- ☐ See your text

Proportion
- ☐ Not primary (half to whole relationship)
- ☐ Changing
- ☐ See your handwriting aid

Quality of Pencil Line
- ☐ Too heavy
- ☐ Too light
- ☐ Varying
- ☐ Kinky (looks slow)
- ☐ Wild and uncontrolled

Slant of Writing
- ☐ Too slanting
- ☐ Not vertical (back slant)
- ☐ Irregular (too many different slants)

Figures
- ☐ Poor figures

Form of Letters
- ☐ Poor circles
- ☐ Places illegible
- ☐ Poor straight strokes
- ☐ Parts of letters disconnected
- ☐ Capital letters weak

Spacing
- ☐ Within letters
- ☐ Between letters
- ☐ Between words
- ☐ Between lines
- ☐ Too wide
- ☐ Crowded
- ☐ Irregular
- ☐ Poorly arranged on page
- ☐ Margins uneven

Alignment of Letters
- ☐ Off the line in place
- ☐ Low letters uneven in height

Fluency
- ☐ Too fast
- ☐ Too slow

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Name

Cursive Handwriting Grading Slip

Your Cursive Handwriting has been thoughtfully analyzed and rated according to the chart below. Any item checked in Section I is outstandingly good and worthy of mention. Any item checked under Section II is faulty and needs improvement. To improve your handwriting, you will want to note the items checked and then review the lesson giving special attention to them—the good ones, to be continued; the faulty ones, to be corrected.

Section I Good

- ☐ Appearance of writing
- ☐ Margins
- ☐ Slant of writing
- ☐ Quality of pen or pencil line
- ☐ Spacing in and between words
- ☐ Letter forms
- ☐ Size of writing
- ☐ Alignment of letters
- ☐ Figures
- ☐ Proportion

Fluency
- ☐ Too fast
- ☐ Too slow

Spacing
- ☐ Within letters
- ☐ Between letters
- ☐ Between words
- ☐ Between lines
- ☐ Too scattered (wide)
- ☐ Crowded
- ☐ Irregular
- ☐ Poorly arranged on page
- ☐ Margins uneven

An Explanation of the Cursive Handwriting Grade Slip

On nearly every writing paper there are some good features. It is the intent of this "Good" section on this grading slip to pick out the good features and commend the pupil. This tends to instill confidence in his own ability to write. Any of these ten items that are checked good are representative of the best things on the paper.

Section II Room for Improvement

Position of Hand, Arm, Body, or Paper
- ☐ Incorrect

Size of Writing
- ☐ Too large
- ☐ Too small
- ☐ Varying in size
- ☐ See your text

Proportion
- ☐ Not primary (half to whole relationship)
- ☐ Not upper grade
- ☐ Changing
- ☐ See your handwriting aid

Quality of Pen or Pencil Line
- ☐ Too heavy
- ☐ Too light
- ☐ Varying
- ☐ Kinky (looks slow)

Slant of Writing
- ☐ Too slanting
- ☐ Too nearly vertical
- ☐ Irregular

Alignment of Letters
- ☐ Off the line in places

Section I Good
- ☐ Appearance of writing
- ☐ Margins
- ☐ Slant of writing
- ☐ Quality of pen or pencil line
- ☐ Spacing in and between words
- ☐ Letter forms
- ☐ Size of writing
- ☐ Alignment of letters
- ☐ Figures
- ☐ Proportion

Section II Room for Improvement

Position: This refers to the position of the hand, arm, body, or paper.

Incorrect

When position is checked on the grading slip, it means one of four things:

1. Position of your body is incorrect.
2. Position of the paper is incorrect.
3. Position of your hand and arm is incorrect
4. You are holding the penholder or pencil wrong.

- ☐ Uneven in height
- ☐ Capital and loop letters uneven
- ☐ Minimum letters vary
- ☐ Intermediate letters vary

Form of Letters
- ☐ Angular letters
- ☐ Letters too round
- ☐ Letters too thin
- ☐ Places illegible
- ☐ Beginning strokes poorly made
- ☐ Ending strokes poorly made
- ☐ Poor loop letters
- ☐ Upper ☐ Lower

Capital letters weak
- ☐ Too small ☐ Too large
- ☐ Small letters need strengthening
- ☐ Disconnected letters in words
- ☐ Down-strokes not uniform

Figures
- ☐ Poor figures

How can we tell this by looking at your writing?

If your writing is too nearly vertical or too slanting, there is something wrong with position. Either the body position is not right, the paper is being held at the wrong slant, or you are not writing in front of your eyes and pulling the down-strokes toward the center of your body (for the left-hander, pull down-strokes toward the left elbow).

If the bottoms of the letters are shaded, there is too much pressure being put on the pen or pencil at the bottom of each letter. The pen or pencil is being held incorrectly.

Position and slant go hand in hand. If your paper and body are in the correct position, and if you write directly in front of your eyes and pull all of the down-strokes or slant-strokes toward the center of your body, the slant of your writing will be accurate, uniform and regular.

Source: F. W. Freeman, *Reference Manual for Teachers, Grades One Through Four* (Columbus, Ohio: Zaner-Bloser, 1965), pp. 21-23

Reprinted from Hammill, D.D. & Poplin, M. Problems in writing. In D.D. Hammill & N.R. Bartel (Eds.) Teaching children with learning and behavior problems. 2nd edition. Boston: Allyn and Bacon, 1978.

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APPENDIX XVII

Pupils' Names	Composing						Mechanics		
	Purpose	Content	Organization	Sentences	Paragraphs	Word Choice and Usage	Capitalization	Punctuation	Handwriting

Source: Wallace, G. & Larsen, S.C. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

Analysis of Written Usage

Pupils' Names	Verbs				Pronouns				Adjectives/ Adverbs		Words				
	Tense form	Tense shift	Agreement	Auxiliary missing	Subject or object position	Pronoun/adjective	Antecedents	Form	Confusion	Article	Comparison	Addition	Omission	Substitution	Plural	Substandard

From Paul C. Burns. *Diagnostic teaching of the language arts* © 1974, p. 101.

Sample of an Analysis Chart

Items	Example of Errors
Verbs	
1. Tense form	He seen it. I have come home. Bill come home.
2. Tense	Inappropriate shift between sentences.
3. Agreement	They was here.
4. Auxiliary missing	He standing there.
Pronouns	
1. Subject or preposition object	Him did it. With Sam and I he went.
2. Demonstrative adjective	Them books are mine.
3. Unclear antecedents	Mary and Jane were there and she saw him do it.
4. Form	Our'n, her'n
Adjectives/Adverbs	
1. Confusion (*good* for *well*)	Everything went good.
2. Article (*a* for *an*)	She and I go to an store.
3. Double comparison	He is more bigger than I am.
Words	
1. Additions	This here dog is pretty.
2. Omissions	She went the movie.
3. Substitutions	Sally sat on the there.
4. Plurals	The two boy played.
5. Nonstandard	I ain't going there.

Source: Wallace, G. & Larsen, S.C. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

Common Errors in Punctuation

Errors	Possible Causes
Omission of period at end of sentence	a. Carelessness b. Indifference c. Poor observation d. Haste
Omission of period	a. Carelessness b. Insufficient practice c. Lack of "abbreviation consciousness"
Failure to use a colon	a. Intellectual immaturity b. Lack of sensitivity to emotional overtones of written materials
Omission of question mark after question	a. Carelessness b. Indifference
Failure to set off nonrestrictive clause by a comma	a. Lack of appreciation of a suspension of thought b. Lack of observation
Failure to set off a series by commas	a. Carelessness b. Lack of writing experience c. Lack of attention to details d. Misunderstanding of the concept of "series"
Lack of commas setting off an appositive	a. Failure to understand the relation of the insertion to the sentence proper

Furness, E. L. Pupils, pedagogues, and punctuation. *Elementary English*, 1960, 37, 187-189.

Source: In G. Wallace & S.C. Larsen. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

APPENDIX XX

Analysis of Punctuation Errors

Pupils' Names	Period	Comma	Semicolon	Colon	Quotation mark	Apostrophe	Question mark	Hyphen	Underlining

Source: Paul C. Burns, *Diagnostic teaching of the language arts* © 1974, p. 90. Re-

Printed in G. Wallace & S. C. Larsen Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.

Analysis of Capitalization

Pupils' Names	First word of sentence	The word "I"	Proper names	Titles	Proper adjectives	First word of quotation	Words for the deity	Appropriate abbreviations	Salutation and closing of letter	Words such as mother, father when used as a name	Trade names

Source: Wallace, G. & Larsen, S. C. Educational assessment of learning problems: Testing for teaching. Boston: Allyn and Bacon, 1978.